TRANSIT COOPERATIVE RESEARCH PROGRAM

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Transit-Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities

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This report will be of interest to individuals seeking to improve the livability of their communities and to those concerned with the role that local streets and public transportation can play in pursuing this goal. The report presents 10 strategies used in both the United States and Europe to create transit-friendly streets. The strategies are followed by case studies of five communities that have pursued different initiatives to improve their livability by making their streets more transit-friendly. The report culminates with lessons learned from the case studies. The report is very practical and will be useful to transit professionals, transportation planners, engineers, city officials, and local communities.

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Report 33

Transit-Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities

PROJECT FOR PUBLIC SPACES, INC.
New York, NY

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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions,* published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transit Association (APTA), *Transportation 2000,* also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academy of Sciences, acting through the Transportation Research Board (TRB), and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

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The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, the Transit Development Corporation, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

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FOREWORD

By Staff
Transportation Research Board

This report will be of interest to individuals seeking to improve the livability of their communities and to those concerned with the role that local streets and public transportation can play in pursuing this goal. The report presents 10 strategies used in both the United States and Europe to create transit-friendly streets. The strategies are followed by case studies of five communities that have pursued different initiatives to improve their livability by making their streets more transit-friendly. The report culminates with lessons learned from the case studies. The report is very practical and will be useful to transit professionals, transportation planners, engineers, city officials, and local communities.

TCRP Project H-4D(2), "The Role of Street Design and Traffic Management in Supporting Transit and Livable Communities," addresses the connection between transit and streets, recognizing that the design and management of streets and traffic can and does impact the livability of communities. The research report sets the context for the research results by providing the following definition and goals for transit-friendly streets:

> Transit-friendly streets make transit use *more* efficient and convenient while making the street *less* convenient for automobiles while still accommodating them. At the same time, other functions of a street are recognized so that transit does not overwhelm the street. Transit-friendly streets accomplish the following four goals:
>
> - Establish a clear priority for transit vehicle operations with convenient, accessible transit stops;
> - Reduce conflicts between cars and other private vehicles, including reduction of vehicle speeds;
> - Create a strong pedestrian orientation, including adequate circulation space, ease in crossing streets, and appropriate amenities, all of which contribute to comfort and convenience; and
> - Integrate the whole process of planning shared transit streets into a larger community development or livability-enhancing strategy, working closely with the communities impacted by the program.

The research included five detailed case studies, representing different types of communities and settings with different traffic management and street design strategies, that demonstrate how and why transit was critical to improving livability and the function of the street. The case studies are highly transferable to other places in the United States because the concepts presented can be pursued regardless of location, type of transit service, or character of the commercial district. The cases present a range of budgets including short-term, small-scale efforts, as well as major capital program and long-term projects. Importantly, the cases describe how obstacles and barriers were overcome. The lessons presented in the final section of the report will benefit any community seeking to improve its design and traffic management strategies to support livable communities.

TRANSIT-FRIENDLY STREETS: DESIGN AND TRAFFICE MANAGEMENT STRATEGIES TO SUPPORT LIVABLE COMMUNITIES

SUMMARY

In Phase I of the TCRP H-4D project research program ("The Role of Transit in Creating Livable Metropolitan Communities," *TCRP Report 22*), Project for Public Spaces, Inc. (PPS) focused on the important part that transit is playing in fostering community livability and the specific ways that transit is acting as a catalyst for community improvement. Livability concerns of communities—such as generating economic opportunities, revitalizing downtowns and neighborhoods, improving safety and image, and making communities more accessible and convenient—were correlated with transit services and facilities in cities across the United States. Opportunities for transit to work in partnership with communities in order to leverage limited transit dollars also were investigated.

This Phase II report addresses the connection between transit and streets, recognizing that the design and management of streets and traffic can and does affect the livability of communities. This report presents strategies that are emerging across the United States, where the effective, balanced incorporation of transit into city streets is having a positive impact on livability and quality of life.

Concerns about livability affect every community: inner cities, suburbs, small towns, and rural areas. This study adopts a "place-making" approach to creating transit-friendly streets, where a local community, working in partnership with a transit agency, plans and implements neighborhood-scale projects and programs that are mutually supportive of community livability and transit ridership goals.

Chapter 2 defines the term "transit-friendly streets" and describes it from both an American and a European perspective. Techniques for balancing street uses among various modes, such as traffic calming, are briefly discussed.

Chapter 3 presents case studies of five cities (Portland, Oregon; Rochester, New York; San Francisco, California; Ann Arbor, Michigan; and Somerville, Massachusetts) with transit-friendly streets that achieve community livability goals; the role played by communities, transit agencies, municipal agencies and authorities, and the federal government is also discussed. The introduction to Chapter 3 describes the selection criteria for case studies and the research approach used to collect the data and background information for the case studies.

Chapter 4 presents a more in-depth discussion of methods and strategies to create transit-friendly streets. The issues presented by each of the case studies and the strategies

used to address them are summarized and examples are provided where specific street design and traffic management techniques were successfully employed. The chapter also provides a checklist of design, management, and transit strategies and describes how they can be used to address specific local problems as part of a "place-making" process.

Chapter 5 concludes by tying the report findings back to the issue of livability, with a discussion of directions for future research.

A bibliography, the results of surveys conducted, a matrix of other transit-friendly street projects and a list of interviewees for the project can be found in the Appendices.

CHAPTER 1

INTRODUCTION

Streets are a fundamental public space in virtually all communities—large and small, urban and rural. As the place where people traditionally have come together to conduct the activities of their daily lives, streets function as much more than transportation corridors. Because of their multipurpose role, streets are inextricably related to the livability of a community.

Throughout the United States, however, a half-century of transportation decisions to accommodate the automobile have contributed to the disappearance of streets where people can comfortably walk, catch a bus or train, meet friends, shop, stroll, and socialize. This has hastened the deterioration and livability of cohesive communities in small towns and large cities across the United States. All too many communities—especially in neighborhood commercial districts and downtown areas—now cope with fast-moving traffic, expanses of wide streets, and narrow sidewalks. These conditions make it difficult for transit agencies to operate efficient service that is comfortable and convenient for riders.

Beginning in the 1970s, however, communities began to recognize and reverse these trends. As explored during Phase I of this TCRP research program, "The Role of Transit in Creating Livable Metropolitan Communities," success is produced by communities working in partnership with transit and transportation agencies to shape both street design and management to better balance the needs of a variety of users. This represents a reversal in the transportation decision-making process from a top-down approach to one that is bottom-up or based on a community's vision of what it wants and needs. The process becomes more holistic, integrating traffic and transit concerns with transportation, community development, and environmental issues.

If designed to accommodate and balance the needs of all users—not just motorists—streets can contribute to the livability of a community by enhancing safety, comfort, and convenience for pedestrians, bicyclists, and transit users alike. For the transit user, better management and design of streets not only can improve reliability of service—by reducing the competition for street space among cars, buses, or light rail vehicles—but also can make it safer and more accessible for transit patrons. In addition, these approaches can be combined with other transit strategies to realize even greater social and economic impacts, whether it be revitalizing a downtown, restoring cohesiveness to a community, or creating new development opportunities.

ABOUT THIS REPORT

The overall goal of this study is to identify specific ways that streets in commercial districts have been designed and managed successfully to support effective, efficient, and convenient transit operations that make communities more livable and to evaluate the successes and failures of different strategies applied throughout the United States. The research assesses both the impact of actual design and management changes to streets as well as the planning processes that led to these changes. It also explores anticipated future improvements or modifications.

Background for this study is based on a literature search of existing journal articles, books, reports, and other materials reviewed with the objective of identifying and defining model standards, strategies, and successfully implemented projects in the United States and Europe. In addition, a series of telephone interviews with key individuals was conducted. Transit operators, representatives of professional associations, traffic specialists, academic and government researchers, and planners were interviewed. A list of interviewees is included in the appendices along with a research bibliography.

This handbook presents five case studies, and the projects represent a clearly growing interest in and commitment to the concept of transit-friendly streets. From the initial interviews and research, a listing was prepared of more than 20 streets that demonstrate design characteristics and strategies developed to enhance transit's effectiveness and community livability. Cities with projects that are in the planning stages or that were recently constructed range geographically from Orlando to Phoenix and include older eastern cities like Boston as well as new growth communities like Portland, Oregon. (See Appendix A.)

Based on this initial research, five streets were selected for in-depth analysis: downtown Ann Arbor, Michigan; NW 23rd Avenue, Portland, Oregon; Main Street, Rochester, New York; Upper Market Street, San Francisco, California; and Davis Square, Somerville, Massachusetts. Each of these case studies represents not only different types of communi-

ties and settings but different traffic management and street design strategies as well.

All projects selected preserve some level of private vehicle use. Also, each street selected as a project site involves at least one mode of transit mixed with pedestrian use (or the street is adjacent to subway or commuter rail stations). We chose to exclude streets where private vehicles are completely banned. Although this is a common practice in Europe, it has much less application in the United States. This study also focuses exclusively on commercial districts where transit, vehicle, and pedestrian uses are concentrated rather than on strategies used on residential streets.

This report begins with an overview of the European strategies for improving transit service through transit priority, street design, and "traffic-calming" measures that help to make communities more economically and socially viable. The European experience helps to provide a framework for understanding the context of many of the projects and programs in the United States as presented in the five case studies highlighted in this report. Chapter 4 summarizes the overall methods and strategies used to create transit-friendly streets and presents a methodology for communities to use in the design and planning of transit-friendly street projects that improve the livability and vitality of their commercial districts.

Finally, it should be noted that an important companion TCRP study to this report is *TCRP Report 19*, "Guidelines for the Location and Design of Bus Stops." This report is intended to assist transit agencies, local governments, and other public bodies in locating and designing bus stops that consider bus patrons' convenience, safety, and access to sites as well as safe transit operations and traffic flow. Detailed guidelines are presented for how to accomplish this goal in a variety of transit-operating environments, including downtown and neighborhood commercial districts.

CHAPTER 2

TRANSIT-FRIENDLY STREETS

There is a need to change priorities in the way our streets and public spaces are designed and managed so that they can play a useful role and make life more enjoyable in towns and villages. Transport and traffic policy in [urban] areas has to be aimed at improving safety and environmental quality rather than the accommodation of more and faster traffic.

—Devon County Council, England (1)

Transit-friendly streets are streets where transit use is made *more* efficient and convenient and the street is made *less* efficient and convenient for automobiles while still accommodating them. Transit-friendly streets involve "balancing" street uses rather than having any single mode dominate. There is, in fact, a kind of equilibrium that is achieved among all the uses of a street: transit, car, bicycle, and pedestrian.

For the purposes of this study, transit-friendly streets accomplish the following four goals:

- Establish a clear priority for transit vehicle operations with convenient, accessible transit stops;
- Reduce conflicts between cars and other vehicles, including reduction of vehicle speeds;
- Create a strong pedestrian orientation, including adequate circulation space, ease in crossing streets, and appropriate amenities, all of which contribute to comfort and convenience;
- Are conceived of and integrated into larger community development or livability enhancing strategies, which involve working closely with the affected communities.

The results of the case studies presented in this report show that, because streets have many different patterns of use, there is no single way to achieve an optimum balance. Therefore formulaic solutions (such as transit malls, described below) sometimes fail. This balance, we have found, can be achieved more effectively when the public participates in the planning process.

TRAFFIC CALMING

In Europe, where this approach has been implemented more commonly than in the United States, transit-friendly streets is the latest phase in an evolution of approaches that began two decades ago with the earliest so-called "traffic-calming" measures. Originally introduced in the Netherlands and Germany, and now expanded to countries such as Denmark, Sweden, and the United Kingdom, traffic calming began initially as a way to create protected residential neighborhoods (see Figure 2-1). Through what are called *woonerf* in Holland and *verkehrsberuhigung* in Germany, the philosophy that neighborhood streets belong to the residents and not to automobiles was promoted. This notion has led to a reversal of the traditional rules of the road. In protected neighborhoods, automobiles are allowed on the road with the residents' sufferance; pedestrians and children are allowed anywhere on the street and cars must not exceed a pedestrian's pace.

Types of Traffic-Calming Measures

Traffic-calming measures fall into two general groups: one based on traffic management strategies and one based on physical design techniques:

- **Traffic management strategies** include issuance of center-city passes, truck restrictions, signalization systems, transportation system management, parking man-

Figure 2-1. Traffic calming in the city center of Koge, Denmark.

agement, traffic reduction ordinances, car and fuel taxation, and speed limits.

- **Traffic-calming physical design techniques** create physical impediments to speeding, such as road undulations, humps, rumble strips, and speed tables (crosswalks raised to sidewalk level). Some make use of strong vertical elements to create pinch points or gateways. Because a wide, straight street with perfect visibility is most conducive to speeding, some traffic-calming approaches reverse this effect through the creation of illusions of narrower street widths by altering the driver's sight lines. The interruption of sight lines is often accomplished by changing the road's direction through incorporation of "S" bends or by implementing staggered parking or neckdowns. Other direction controls include traffic circles, offset intersections, diagonal diverters, and channels. Interestingly, it is possible to make the roadway look narrower by changing pavement patterns, materials, and color. These techniques can be supplemented by central medians, sometimes asymmetrically curved to further narrow the roadway, and by footway signs. Such a combination of gateway and pattern pavement treatments are used to signal the beginning of a built-up or commercial area or an area where pedestrian volume increases.

Traffic-Calming Applications

From their original application in residential neighborhoods, traffic-calming measures have been widely applied to city centers as well as to commercial districts. As cities have become more experienced and comfortable with the concept, it has also been expanded to arterial and state roads at points where they pass through small towns and urban neighborhoods (Figure 2-2). In Denmark, the Department of Transport found, through extensive experimentation, that it was no longer necessary to build expensive bypasses around small towns if appropriate traffic-calming measures were implemented. Combined with the long tradition of dedicated pedestrian zones in central cities, these measures have been successful in bringing new life and vitality to these neighborhood and commercial centers. Unlike traffic signals, which simply control vehicles, traffic-calming measures enhance the pedestrian environment and make walking, shopping, and socializing easier and more pleasant.

Traffic calming has served to reshape attitudes toward transportation in general. As Hartmut Topp, a noted German transportation planner, describes: "Nowadays, views of people, planners, and politicians have changed in favor of public surface transport. It is now common sense that the surface of the city belongs to pedestrians, bicycles, buses, trams, light rails, and to cars and vans only to an unavoidable extent as far as business, service and deliveries are concerned. In the city centers, it is now the car which has to retreat" (*2*).

TRANSIT-FRIENDLY STREETS: THE EUROPEAN EXPERIENCE

> *I was struck by the similarity of European problems to those that are faced by transit agencies here in the United States. I believe that many people in the United States look at solutions proposed by European transit agencies and say that they don't apply here because of the different climates, cultures, and availability of cars. What I actually saw was that even in Europe the car has become a major competitor for transit riders and for local and federal funders. . . . If you understand that the problems are similar, then the solutions can also be similar. Many of the ideas and technologies that we saw are applicable in the United States.*
>
> *—Carolyn Wilder, Assistant General Manager, MARTA, Atlanta, Georgia, commenting on the TCRP International Transit Study Program trip to Europe, 1995 (3)*

Although cultural differences abound, the European experience offers many useful lessons for the United States. European countries have, of course, a well-developed and well-used public transportation system. Because of the extensive implementation of traffic calming in Europe in the past few decades, the opportunity now exists to assess the impacts of traffic calming—positive and negative—on public transit systems.

Europeans have discovered that traffic-calming strategies offer many potential benefits to transit: access to buses becomes more convenient and scheduling and efficiency improves because competition over street space is reduced. Pedestrians can reach transit facilities without having to contend with speeding vehicles or extra-wide streets that are difficult to cross. When combined with other strategies, such as reallocating roadway space, widening sidewalks to allow more space for pedestrians, and creating more streetscape amenities, traffic calming can benefit transit riders as they approach or wait at a transit stop. In addition, many traffic-calming measures can be combined with station revitalization strategies to create pleasant, pedestrian-friendly environments around these transit hubs.

Figure 2-2. A multimodal intersection in Copenhagen.

However, research also reveals that as traffic calming has expanded from local residential streets to main roads and commercial areas, streets with buses are often affected. When travel times on such streets are increased significantly, bus service becomes less efficient and appealing. Often buses are relocated out of traffic-calmed areas, making traveling by bus less convenient for transit patrons.

One of the most complete overviews of traffic-calming impacts on bus service is provided in the British handbook, *Civilised Streets: A Guide to Traffic Calming* (*4*). This handbook outlines some of the negative effects of traffic calming on bus transport. Some traffic-calming measures suitable for cars, the report asserts, are not acceptable for buses. For example, speed bumps, if they are too steep or too short, can be "very unsuitable for buses. The ride [is] very uncomfortable for passengers and possibly dangerous. In one case, the bus driver's union threatened to withdraw a service over a road that had been fitted with a series of 75mm high standard-type round-top tarmac road humps" (*4*). It should be noted, however, that such speed bumps are not a preferred method for traffic calming of private cars either. The report stresses that it is critical not just to make bus use more efficient but to address the impact on cars as well. "Bus lanes that leave the car users unaffected are half-baked measures" (*5*).

This same philosophy has been applied to light-rail systems in many European cities. In Zurich, for example, transportation policy is "based on management of the existing road system with clear preference for buses and trams, for which 'unhindered travel without delay between the stops' is ensured, and preferential treatment of pedestrians" (*6*). To achieve this goal, Zurich has redistributed roadway functions, depending on the street and location, by implementing measures ranging from converting a roadway to pedestrian and transit traffic only and banning private vehicles to eliminating parking on certain streets to create a transit-priority lane. Smaller scale measures such as prohibiting stops and banning left turns on streets with trams are also frequently implemented.

In addition, Zurich has developed an advanced traffic signal operating system, which is combined with a transit monitoring system. While the transit monitoring system tells every tram or bus driver whether he or she is on or off schedule, and by how much, the traffic signal operating system (or "immediate green") allows trams and buses to minimize the time spent at red lights by giving them priority at intersections. Transit vehicles are detected by sensors as they approach intersections, which turn traffic lights to green, drastically reducing their waiting time and helping to keep them on schedule. As a result of a 20-year program through which these measures were phased in, Zurich now has one of the highest numbers of annual transit trips per capita of any city in Europe (*7*).

Freiburg, Germany, provides another example of a combined strategic approach. In this city, there is a clear understanding of the different functions served by different roads and of the best way to integrate transit service into a particular roadway. For example, the downtown historic center is a pedestrian-only zone where tram service is allowed. The larger commercial core has larger streets with both light rail and cars. Vehicles travel in their own dedicated lane; there is a third lane for on-street parking. Streets extending into outlying areas have separate light-rail and vehicle lanes of different sizes, and there is landscaping and grass within the tracks. In some cases, cars travel in light-rail lanes. In addition, light rail comes directly into town rather than stopping at the edge. Freiburg's effective transit system may both result from and contribute to the fact that the city has a well-used core that continues to function as the true economic and social center of the city.

TRANSIT-FRIENDLY STREETS: THE U.S. EXPERIENCE

Compared with Europe, traffic calming in the United States is virtually nonexistent. However, traffic calming has historically existed in certain American downtown and neighborhood areas and on older residential and commercial streets across the country that were originally designed to serve pedestrians and transit, not the private car. Furthermore, there are many examples of urban centers that, more recently, were transformed when vehicle priorities were reduced and pedestrian accommodations improved: Boston, Portland, and San Francisco have used traffic-calming measures to help improve pedestrian mobility in their downtown areas.

However, the connection between transit and these efforts has been a tenuous one. At one extreme, it is not uncommon for transit considerations to be ignored. This was the case in downtown Ann Arbor, Michigan, one of the case studies in this report, where for nearly 30 years downtown transit improvements and pedestrian improvements proceeded along parallel but unconnected courses. At the other extreme are transit-driven projects, usually funded under transit programs, in which transit use is emphasized, often at the expense of other activities. The transit mall discussion below illustrates the problems with such an approach.

Transit Malls

Transit malls are streets that are transformed to give priority access to buses, eliminate most or all private vehicles, and enhance pedestrian environments including waiting areas for bus patrons. The change in attitudes toward transit malls represents increased understanding about how best to integrate transit effectively into a major downtown area in the United States and about the inherent problems and opportunities.

Minneapolis, Minnesota, constructed the first transit mall in the United States in 1967, and soon after it was hailed as a national example of urban public space. Considered a bold and innovative move in its day, Nicollet Mall successfully generated almost $50 million in downtown development within 3 years. The mall was unique because it included not only amenities for pedestrians but a serpentine roadway that allowed city buses to circulate along the street. Nicollet became a combination bus terminal and shopping street.

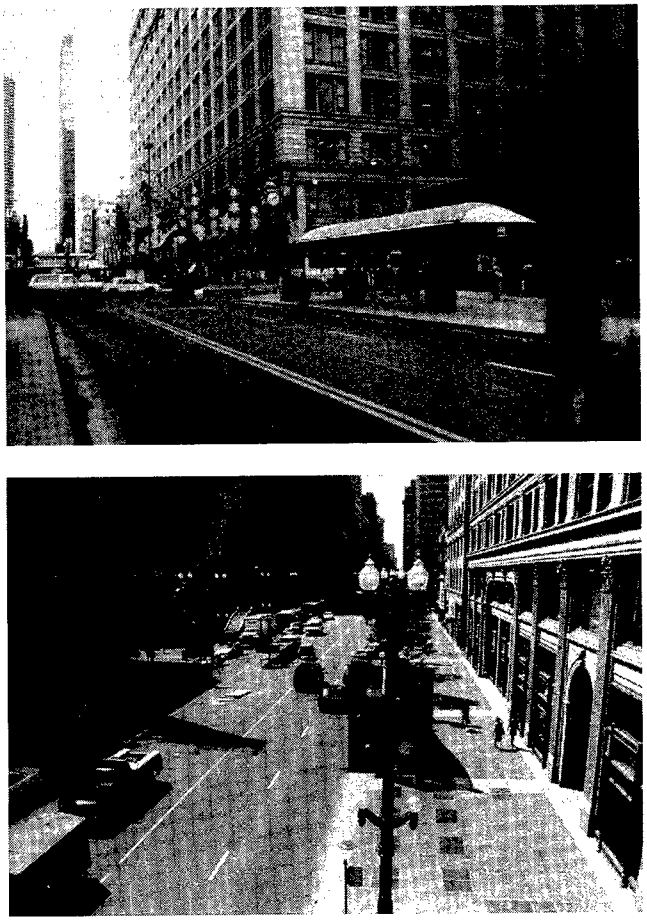
Nicollet Mall was replicated in many cities across the United States: Philadelphia; Portland, Oregon; Denver; and Chicago are the most well known. Their construction was encouraged by federal funding made available by the Urban Mass Transportation Administration (now the FTA). As with pedestrian malls, the limitations of the approach became more apparent as the years progressed. The basic problem was the number of buses and the amount of fumes emanating from them; exhaust fumes are not generally compatible with pedestrian strolling, sitting, and outdoor dining. Bus waiting areas became the streetscape elements on the transit mall. As a result, the transit functions of the street began to predominate over other activities.

In nearly every city where they have been built, transit malls are being rethought or have been altered from their original concept. When Chicago's State Street was a transit mall, sidewalks were widened beyond what was needed and, as a result, they were underused. "The mall took the excitement out of State Street," reports Elizabeth Hollander, Chicago's former planning commissioner. According to Adrian Smith of Skidmore, Owings & Merrill, "the buses would line up, one after another, like a herd, with their diesel fumes" (*8*). A total redesign of the State Street Mall has recently been completed to return it to a mixed-traffic street, made possible in part because the construction of a new subway line reduced the number of buses on the street (Figures 2-3 and 2-4).

Today, sidewalks on State Street are narrower, although they still contain extensive pedestrian amenities—the idea is that buses mixed with traffic are less dominant than buses alone. (Ironically, there are no bus shelters on the street at all because merchants did not want their display windows blocked.) The reconstruction of State Street has encouraged new private investment; all subway stations along State Street are being renovated, and a new central library has been built. In general, the street is being rediscovered.

The bus mall in Portland, Oregon, has successfully integrated transit, automobiles, and pedestrians. Although it is predominantly transit oriented, the mall has always allowed one lane of private automobile traffic. The mall is attractively laid out with well-designed bus waiting areas, simple street amenities (e.g., benches, information kiosks, and plantings) and well-placed public art. The placement and design of amenities is often poorly understood by designers; in the case of Portland, however, amenities are usable and are placed according to function. Because of the design of these street amenities, the mix of traffic, and the excellent maintenance and street management program, the mall is one of the most successful in the country.

Even in Portland, retail uses have decreased though along the mall in the past decade as shopping has shifted to streets served by a new light-rail system, initiated in 1986, that intersects the transit mall. Metropolitan Area Express (MAX) is a 15-mile route that connects the suburbs to the downtown area and becomes part of the downtown street network. One of the strengths of the system is that the modal mix in which it operates changes according to the street block. In general, it runs on mixed-traffic streets, which somewhat discourages private vehicle use. Where mixed traffic does occur, space for cars is limited and, on certain streets, shared space is allocated to pedestrians only. Sidewalks have been widened slightly to accommodate small waiting areas. The trains, although long, are quiet and relatively unobtrusive, but they clearly operate in street space rather than in a pedestrian mall (*9*).



Figures 2-3 and 2-4. Chicago's State Street as a transit mall (above) and back to a street (below).

Figure 2-5. Before MUNI added bus bulbs or nubs along 17th Street, buses often stopped in the street to pick up passengers.

Transit-Preferential Street Programs

One of the limitations of transit malls is their scale; very few communities can afford such a large investment. San Francisco and Portland have developed progressive programs that stress a wide range of lower-cost improvements that can be implemented incrementally throughout a community.

In San Francisco, a "Transit Preferential Street" program (TPS) was started in the mid-1970s, following a 1973 "Transit First" policy initiated by the city. The policy states that public transit has priority over automobiles on city streets. "The philosophy of the program is that, on streets with heavy volumes of transit vehicles, and especially on streets where the city has invested in transit guideway infrastructure such as light-rail lines and trolley coach lines, transit priority treatments will allow the city to make better use of its resources by moving people more efficiently in transit vehicles" (*10*).

Although some projects were funded at the outset, such as bus bulbs, bus lanes, and a pilot signal preemption system, it was not until 1989 that funding was set aside for TPS projects and staff. Today, the program matches transportation-designated sales tax revenues with state, federal, and local funds to implement a variety of projects, which range from simple to capital intensive. Projects are developed by a technical advisory committee and staff representing three city departments: the transit agency (MUNI), Parking and Traffic, and City Planning. Recent projects have included the following:

- Signal preemptions, which give transit vehicles a green light as they approach an intersection. These have been installed on Mission Street (trolley coach) and Ocean Avenue (light rail);
- Ten miles of transit lanes on 11 streets, mainly in the downtown area;
- Bus bulbs at locations like Castro and Market Streets, which create larger waiting areas and expedite bus boarding (Figures 2-5 and 2-6);
- Consolidation and relocation of bus stops; and
- Center-lane boarding islands for buses and light-rail vehicles.

Most of these projects have been implemented in an experimental manner, and "some treatments have proven more effective than others" (*11*). In general, however, the program has been successful in addressing the imbalances between cars and transit on city streets. (The Upper Market Street case study, presented below, is another example of this program's impact.)

A similar effort, also called "Transit Preferential Streets," is being studied in Portland, Oregon. As in San Francisco, the goal of this program is to improve transit travel times and services by giving priority to transit vehicles where conflicts with automobiles occur. This goal reflects Portland's "Transit First" policy, adopted in 1992:

> Increased transit demand and on-street congestion have increased travel times in the central city areas and along congested bus routes. Increased travel times result in a one-half percent increase each year in transit operating costs. The current solution to this problem is to add buses on routes that experience increased traffic congestion and/or ridership. This remedy also results in additional service delays by increasing congestion. (12)

The city hopes to initiate demonstration projects after completion of the feasibility study, which is now under way. In this way, it is hoped that obstacles to the program, including concerns in neighborhoods about whether transit or automobiles should have priority, will be overcome. It is ironic that the problem locations for transit are those

Figure 2-6. With the addition of bus bulbs, buses are able to load from the moving lane, and sidewalk circulation space has increased.

that are congested with too many automobiles. How best to change the balance of modes becomes a fundamental question of which mode of transportation should be given priority.

According to the Texas Transportation Institute, the TPS strategies outlined above represent "the most promising . . . for improving bus service." In *TCRP Report 19*, "Guidelines for the Location and Design of Bus Stops," they suggest that implementation of these programs necessitates "a high concentration of bus services, high levels of traffic congestion and community support for transit services" (*13*).

Although it is an important concept, TPS has limitations in terms of public acceptance of changes that would radically alter or limit a street's access to cars. However, as the next section explores, strategies for transit-friendly streets seek to redress an inequity of balance between uses of a street. Such inequity can be addressed with modest changes or major ones, by incremental improvements or major capital programs.

CHAPTER 3

CASE STUDIES

This chapter presents the experiences of projects in five different cities—within greatly different contexts—where transit has been integrated into a downtown or neighborhood commercial district: downtown Ann Arbor, Michigan; NW 23rd Avenue, Portland, Oregon; Main Street, Rochester, New York; Upper Market Street, San Francisco, California; and Davis Square, Somerville, Massachusetts. These case studies were identified for more detailed analysis based on a number of criteria. Most important, we were seeking examples that met the four goals of transit-friendly streets as presented in Chapter 2.

SELECTION OF CASE STUDIES

In addition to meeting the four goals, other criteria for selection included the following:

- *Multidimensional activities demonstrate community livability objectives.* Case studies illustrate "best practices" in the following ways:
  - Active community involvement in the planning process;
  - Integration of streets as part of larger community development or improvement strategies that encourage a high level of accessibility with less dependence on automobiles;
  - Street design, amenities, elements, public services, and activities that respond to transit use and community needs;
  - Innovative implementation strategies through public-private partnerships and community-based initiatives; and
  - Innovative management strategies for security, maintenance, and traffic operations.

- *There is considerable transferability to other places in the United States.* Case studies will illustrate initiatives or objectives that other communities could pursue and achieve.
- *Different locations throughout the United States, as well as different sizes and types of communities and transit systems, are included.* The examples will show that the concept can be effectively pursued, regardless of geography or type of transit service, and applied to different categories of streets in metropolitan commercial districts.
- *Practitioners will find useful information and insights.* The transit industry, transportation planners, engineers, city officials, and local communities are primary audiences for the research results. Consequently, practitioners should benefit from the information presented and be able to act on it, and apply it to improve communities and local transportation services.
- *Transit has had an impact.* Examples demonstrate how and why transit was critical to improving livability and the function of the street.
- *Transit and traffic-calming policies are linked.* A relationship between transit and supportive traffic policies is evident.
- *A range of budgets is represented.* The case studies illustrate short-term, small-scale efforts that have had an impact as well as major capital programs and long-term projects and policies.
- *Obstacles have been overcome.* Transit and traffic innovations face many obstacles and barriers. Examples where these obstacles have been overcome will be presented.
- *Where detailed user studies are to be conducted, projects must be established long enough to be evaluated.* Preference was given to sites where PPS has information or data about the conditions before completion of the project.

METHODOLOGY

Visits were made to each of the selected sites to observe and document the projects. In preparation for each site visit, the project team conducted additional telephone interviews to identify potential participants for the focus group discussion and obtained general descriptive information about each transit system, such as design and current use of adjacent streets, previous planning reports, design plans, and traffic information.

Focus Group Discussion

During the site visit, the project team conducted a focus group meeting with local public transit, transportation, and

community development officials; neighborhood associations; and citizens to discuss the original goals of the project and to evaluate what has or has not worked. Often, it was the first time that members of the group had met one another or convened since completion of the project. The focus groups dealt not just with past decisions but addressed new approaches and explored changes that needed to be made either to the project under discussion or to other areas in the city.

The following specific issues and questions were discussed during the focus groups:

- What were you trying to achieve with the project?
- In general, did you achieve your goals?
- What about the project works well?
- What does not work?
- What would you do differently if you were starting over?
- What about your experience is transferable to other transit agencies?

Interviews and Documentation for Selected Projects

Interviews were conducted, when necessary, to follow up with local community representatives responsible for each project or program. The purpose of the interviews was to obtain information about *how* and *why* the project was implemented, the role of the community in the implementation, and how various obstacles were overcome. For each case study, specific data (when available) were also collected: street and lane use, transit usage and volumes, transit stop location and design, lane width, street geometrics, parking layout, design speeds, crosswalk configuration, signalization, signage and information, vehicle and pedestrian volumes, and pedestrian and vehicle accident statistics for the periods before and after each project was completed. Particular attention was paid to evaluating effects of the project on traffic, consulting with local traffic engineers, and observing the functioning of the streets during peak periods.

Detailed Case Study Evaluations

Three of the five case studies were selected for detailed user evaluations, including a series of systematic data collection efforts designed to study people's actual use and perception of specific streets. The three sites selected were Main Street in Rochester, New York; NW 23rd Avenue in Portland, Oregon; and Upper Market Street in San Francisco, California. (At two additional sites—Davis Square in Somerville, Massachusetts, and Ann Arbor, Michigan—on-site evaluation and focus group sessions were conducted, but the more extensive user evaluation was beyond the scope of the study.)

Activities included the following:

- Intercept surveys of pedestrians, transit riders, and businesses on the street about their perceptions of a variety of topics, including traffic flow and ease of crossing the of street. Approximately 75 to 100 surveys were administered to pedestrians in each city, 25 to businesses, and 75 to 100 to transit riders waiting at bus stops. The business surveys were handed out to all retail businesses facing the street (the numbers varied by location) and were collected the next day. (See Appendix D: Survey Results/Sample Forms.) Surveys were taken to create a random sampling of street users. When volumes allowed, every third pedestrian or transit rider was surveyed. When fewer subjects were available, everyone present was approached for an interview. When interviews were interrupted because subjects' buses had arrived, they were given a stamped, addressed envelope and asked to complete the survey on their own and mail it back the research team. Some surveys were self-administered and others were conducted by the research team. Surveying typically took place during the busiest times of the day. For transit passenger interviews, this was weekday morning rush hour (7 to 9 a.m.) and the evening rush hour (4 to 7 p.m.). Pedestrian surveys were conducted during weekday lunch hour (noon to 2 p.m.) and business surveys were handed out and picked up around 10 a.m. when stores typically opened for business. In Portland, the research team conducted transit surveys on a Saturday afternoon during peak usage of the street. In Rochester, New York, it should be noted that surveys conducted in 1983 by PPS were replicated, in part, to allow for a comparison of views from before the Main Street project was constructed.
- Systematic observation of pedestrian activity at transit stops and along the street, including traffic flow; vehicle/pedestrian/transit conflicts (including pedestrian crossing movements); and waiting, boarding, and alighting patterns. Observations were conducted over 1 full day and included mapping techniques and time-lapse filming. Filming was undertaken with Super 8-mm cameras taking one frame every 2 sec, allowing general flow patterns to be immediately identifiable.

OVERVIEW OF FINDINGS

Before the individual case studies are presented in detail, it is useful to review the four goals for transit-friendly streets. How did the case studies measure up in general? What was successful? What was lacking? We return to our original four goals:

Is There a Clear Priority for Transit Vehicle Operations with Convenient, Accessible Transit Stops?

All the case study sites achieved a higher priority for transit than what had been previously afforded. In each of the

sites, this was accomplished in a different manner, ranging from inexpensive transit lanes and bus nubs to elaborate transit stations connected to a downtown with pedestrian-oriented sidewalks and streetscapes. About one-quarter of the pedestrians surveyed in Portland and Rochester thought the design of bus stops made them more likely to use transit. (People who arrived by bus or on foot were even more likely to say that the features made them use transit.) In San Francisco, 73 percent of pedestrians agreed that the provision of streetcar service and stops on Upper Market Street made them more likely to use transit.

From an operational perspective, all the transit agencies were pleased with the results of the project in their city. Although minor problems exist (such as placement of amenities that prevent riders from boarding conveniently) and many improvements can be made, most transit agencies thought that service was more efficient. In Rochester, where surveys from 1983 were replicated and compared, all aspects of bus service were rated more highly: frequency of service, reliability, helpfulness and courtesy of bus drivers, and even closeness of bus stops to downtown destinations. The main things that changed were the street and waiting conditions at bus stops (ratings of "excellent" or "good" for those conditions increased from 30 percent to 48 percent); clearly transit riders noticed the difference.

Another sign of the visibility of transit is the perception of local businesses. Businesses surveyed in all three sites (57 percent of those surveyed in Portland, 82 percent in Rochester, and 83 percent in San Francisco) believed that transit was very important or important to the overall area as a place to do business.

Have Conflicts Between Cars and Other Private Vehicles Been Reduced, Including Reduction of Vehicle Speeds?

If transit efficiency has generally been improved, it has not been at the expense of motorists. In no case did local traffic engineers believe that the project obstructed traffic or increased automobile congestion. This was the case in smaller scale projects like Portland as well as on more complex streets like Upper Market Street in San Francisco. In Rochester, traffic flowed more efficiently after Main Street was narrowed, mainly because of a bypass constructed around Main Street for through traffic.

In general, most projects reduced conflicts with automobiles. For example, the Portland bus stop nubs largely prevent illegal and unsafe passing of buses that are stopped to pick up passengers. In Rochester, turning movements have been restricted at some intersections, whereas Ann Arbor's Main Street has a continuous left-turn lane. Such measures help reduce conflicts and congestion at intersections.

Measures aimed at reducing the speed of automobiles were attempted only in Somerville and Ann Arbor. In both cases, sidewalk extensions, paved crosswalks, and narrow traffic lanes—combined with the vitality of the surrounding district—help to reduce traffic speeds. In other communities, pedestrians surveyed thought that cars drove too fast on the streets studied despite the improvements. This was especially the case on wide Upper Market Street in San Francisco (47 percent agreed with the "too fast" rating) and where a posted 10-mile-per-hour (mph) speed limit adjacent to transit boarding islands was routinely ignored. Even on NW 23rd Avenue in Portland, where traffic speeds rarely exceed 30 mph, 37 percent agreed that cars drive too fast. Compared with European examples, much more can be done in terms of traffic calming in all the case study communities.

Was a Strong Pedestrian Orientation Achieved, Including Adequate Circulation Space, Improved Pedestrian Safety, and Appropriate Amenities That Contribute to Comfort and Convenience?

In all the case studies, pedestrian access and circulation were definitely improved. In Rochester, Ann Arbor, and Portland, narrow sidewalks were widened to provide more transit and pedestrian amenities, although in Ann Arbor the transit center is not as well connected to the pedestrian areas as it could be. In Somerville, an entire pedestrian plaza was created around the transit station. Furthermore, transit passengers in all these cities believed it was very easy to walk to the bus stop or transit island and easy to board the bus or train.

Only on Upper Market Street in San Francisco did pedestrian access and orientation fall short, mainly because the sidewalk design dates back to the early 1970s, when there was less awareness of the potential of streetscape improvements to reduce pedestrian crossing distances at intersections. Nearly 50 percent of the pedestrians and transit riders said they had difficulty crossing the street; nevertheless, 67 percent agreed that the street is "a pleasant place to walk." Roughly, 33 percent of pedestrians said they were strolling and window shopping on the street or were meeting friends and socializing. This may mean that the general attractiveness of the street and the variety of shops and attractions help to compensate for difficulty in crossing the street.

In Rochester, however, despite the wide sidewalks and extensive amenities, only 42 percent of those surveyed thought Main Street was a pleasant place to walk. This may be because Main Street has lost most of its retail business in the past decade and relatively few pedestrians surveyed reported they were strolling and window shopping.

Was the Whole Process of Creating Transit-Friendly Streets Integrated into a Larger Community Development or Livability-Enhancing Strategy Working Closely with the Communities Affected by the Program?

Although livability goals were not always expressed, they appeared to be very much on the minds of the residents and

businesses involved in planning the projects. Because this study focuses on commercial districts, it is not surprising that the most common livability goal was economic development and revitalization of the downtown or neighborhood district. This was especially true in Ann Arbor and Somerville. In Rochester, although transit improvements were the driving force, the business community worked with the city to guide the development process.

The level of success achieved in each community also varied. Only in Rochester are economic conditions worse after the project. Because of consolidation, which was occurring widely throughout the United States at the time, two major department stores closed soon after the Main Street improvements were completed. Other stores closed soon afterward, but one of the department stores has been transformed into a busy community college.

In the other four cities, however, there has been a net growth of business and new development. Ann Arbor, a university town, has taken full advantage of its widened sidewalks and pleasant atmosphere with outdoor cafes, restaurants, bookstores, and other local businesses effectively competing with suburban shopping centers. Davis Square, too, has been transformed into a vital and diverse business and entertainment district.

■ CASE STUDY 3-1: NW 23RD AVENUE, PORTLAND, OREGON

In Portland, there is a different policy perspective on what the balance of modes should be. In other parts of the US, it might be harder to convince people that stopping auto traffic with a transit vehicle is a good idea.

—Laurel Wentworth, City of Portland, Office of Transportation Planning

I don't believe that the bulb-outs negatively impact traffic in this situation because of the high volume of pedestrians. The curb extensions make the environment safer for the pedestrians. I think that the situation with the buses now is safer than before as well.

—Don Coville, Transportation Engineer, City of Portland

NW 23rd Avenue is a bustling neighborhood commercial street in the heart of the most densely populated area in Portland, an area of both single family homes and high-rise residences. With ground level retail shops and restaurants, many with apartments on upper floors, NW 23rd is a place to live as well as a place to shop. The street is heavily used by pedestrians, and because the hilly terrain of the neighborhood limits the number of through streets, it is a major transit and traffic artery as well.

The motivation for adding curb extensions to three bus stops along NW 23rd Avenue was to address problems with pedestrian congestion and transit operations on this busy but narrow street. Pedestrians walking along NW 23rd Avenue were forced to navigate constricted sidewalks that also were being used by waiting transit passengers. Sidewalks were too narrow for placement of transit amenities, such as shelters or benches, and even boarding and alighting were problematic because of sidewalk crowding. Cars frequently parked illegally at bus stops so that buses could not pull out of the lane of traffic to pick up and discharge passengers. Intersections were also troublesome: the narrowness of the street and the tendency of cars to park right up to the corner and at bus stops reduced sight lines for vehicles passing through the intersections.

The NW 23rd Avenue curb extension project (Figure 3-1) was more than an experiment on the part of Tri-Met and the city's Office of Transportation, however. The project evolved out of broader discussions within the city, and with the community at large, regarding plans for the whole Northwest district and affecting all transportation modes.

The curb extension project has succeeded in better balancing the uses on the avenue, making it easier for transit vehicles to pick up and drop off passengers, and reducing pedestrian conflicts. At the same time, vehicle congestion has not been increased and conflicts at intersections have been reduced.

Project Goals

As one focus group participant stated, the intent of the NW 23rd Avenue project was "basically to provide the ingredients for lots of people to be out on the street and to feel comfortable being there."

Specifically, the goals of the NW 23rd Avenue improvement project were as follows:

- Make transit service more efficient by allowing buses to stop in the travel lane;
- Reduce illegal parking at bus stops and increase parking on the street;

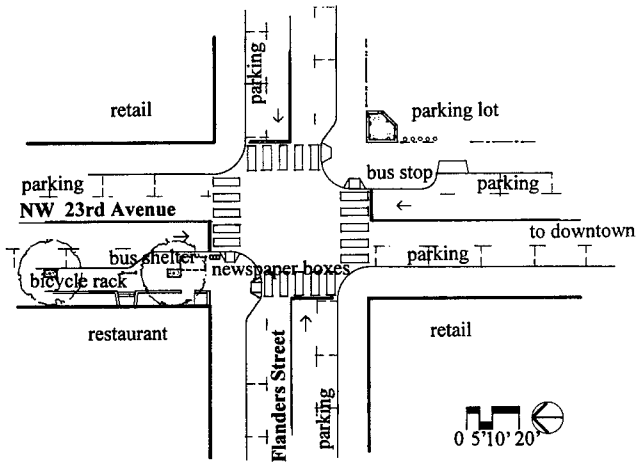


Figure 3-1. Diagram of the NW 23rd Avenue curb extension project.

- Provide additional space and amenities for transit patrons and reduce pedestrian-transit rider conflicts on sidewalks (Figure 3-2); and
- Make street crossing distances safer and shorter thus increasing the ability of pedestrians to see and be seen by oncoming cars and buses.

And last, but not least, the objective was to accomplish these improvements simply and inexpensively without major street reconstruction.

Design and Planning Process

Although simple in principle, the NW 23rd Avenue curb extension project took nearly 15 years to complete. Conceived in 1978 as part of the Northwest Portland Transportation Study, the project was not officially approved until 1989, partly because the idea was a new one and partly because of an extensive (and protracted) community involvement process.

Ten such street projects were included in the Northwest Portland Transportation Study, some of which were combined because of a lack of resources. The study, in which 90 neighborhood organizations participated, was precipitated by the decision to withdraw a proposal for the construction of two major freeways, making Portland the first city in the nation to do so. This focused city energies on retrofitting existing streets instead of on road expansion to improve their function.

Each of the projects had a citizens advisory committee composed of local residents, businesses, and other community organizations. As is typical in Portland, the advisory committee played an active role in planning the project to make sure that broader issues of congestion, parking, and the needs of businesses on the street were addressed.

The sidewalk extensions were finally designed in 1990 and were completed in 1992.

Design Features and Strategies

NW 23rd Avenue has a 55-ft right-of-way, from building front to building front. From curb to curb the street is 36 ft wide, which includes one travel lane in each direction and a lane of parking on each side. The sidewalk widths range from 8 to 10 ft.

As a first step toward reducing the amount of construction required, bus stops were consolidated. Whereas buses used to stop every two blocks, they now stop every three blocks. To ensure that this change would not negatively affect ridership and service provision, Tri-Met conducted pedestrian counts and placed transit service at locations of highest potential use. In the end, sidewalks were extended at only three intersections along NW 23rd Avenue: at Irving, Flanders, and Everett. Traffic impacts of the extensions are minimized, because none of these intersections has a traffic signal.

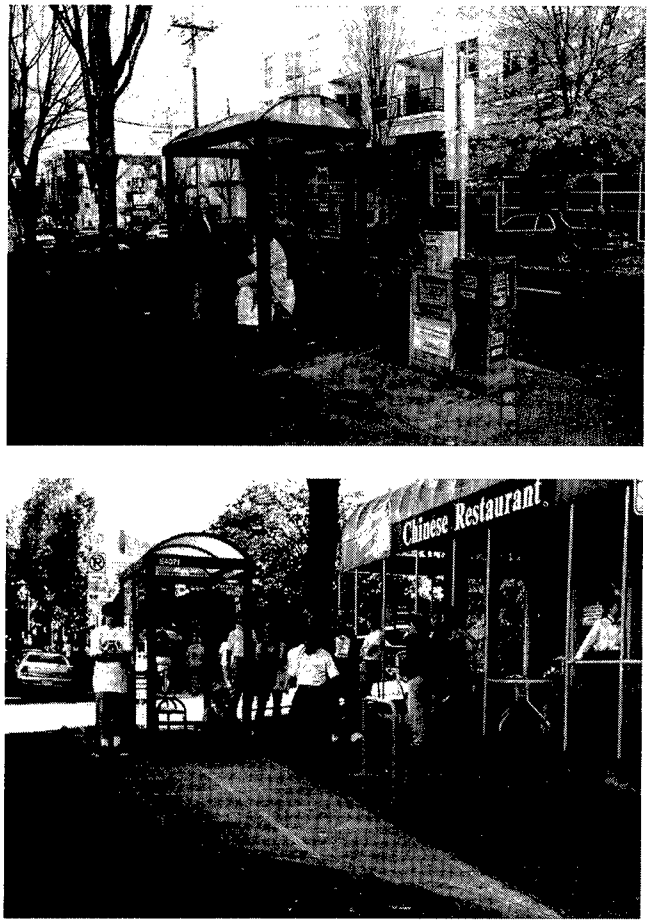


Figure 3-2. The curb extensions along NW 23rd Avenue in Portland, Oregon, provide room for transit shelters and other pedestrian amenities while facilitating pedestrian circulation (above). However, the design and arrangement of amenities can discourage use of the extension by bus riders (below).

Each extension is about 30 ft long (the distance between the front and back doors of a standard bus) and runs the width of a parking lane, adding about 8 to 10 ft to the sidewalk. Transit shelters with seating, phone booths, trash receptacles, and news boxes were added to the bus stops at these intersections. Because the extensions replaced bus lay-by zones, two parking spaces were actually gained because buses no longer need the extra room to pull in and out of the curbside lane.

To contain costs and minimize disruption to the street, the contour of the existing sidewalk slope was simply extended into the street, so that the curb is actually minimized.

Impacts and Assessment

The overall consensus about the curb extension initiative is that it appears to be working well and has been well received by pedestrians as well as motorists. Motorists now experience better visibility, 65 percent of transit passengers

surveyed rated sidewalks widths as "good," and bus drivers reported that they are more likely to stop for pedestrians waiting on the extensions rather than on the street because they are more visible.

Transit Impacts

Before the project was constructed, the No. 15 buses on NW 23rd Avenue rarely pulled completely up to the curb (out of the moving lane) not only because it was difficult to pull back into traffic but also because cars invariably were parked at the bus stop. As a result, passengers often were forced to step off the curb and board the bus between or in front of parked cars.

The 30-ft curb extensions at Flanders, Irving, and Everett are long enough to enable passengers alighting through either the front or back doors to reach the sidewalks. Unfortunately, the bus does not always pull up far enough along the extension to allow this because some of the extensions have become cluttered and the driver must stop precisely. Otherwise, bus doors are blocked by news boxes, telephones, and the bus shelters themselves (which have a solid glass wall facing the street). Curb extensions on the outbound side of the street (where passengers coming from downtown alight) have no amenities at all; at these stops, drivers are able to pull up all the way but the stops are less comfortable for waiting passengers.

Bus drivers generally like the extensions, however, particularly for passengers in wheelchairs. Before the extensions, passengers with disabilities had to be discharged directly into the street or next to or between parked cars. All passengers had to struggle to get around the cars and up onto the curb. Now passengers in wheelchairs as well as passengers on foot can board and alight directly from and onto the curb.

The extensions have not significantly affected travel times for buses on the street because the difference of half-pulling into a lay-by and stopping at an extension is not that significant. Ridership data show a 19 percent increase in ridership on the No. 5 line between 1994 and 1995, although this follows a dip of about the same percentage in 1991.

Traffic Impacts

NW 23rd Avenue is a busy street. About 12,000 cars travel along it every day; traffic is heaviest during the evening rush hour. Traffic volumes on NW 23rd Avenue have remained relatively constant over the past 10 years, but the directional split has changed somewhat. In 1987, there were about 4,000 cars traveling northbound and 8,380 traveling southbound. By 1993, the number had increased to 6,500 northbound and decreased to 6,000 southbound.

Slowing automobile traffic was not one of the goals of the project because it already travels fairly slowly even at nonpeak hours. A study conducted in June 1995, 3 years after the curb extensions were constructed, showed that 85 percent of southbound cars on NW 23rd Avenue traveled at 22 mph in a 20-mph zone, with most traveling between 23 and 28 mph. (This is close to an ideal range for traffic-calming standards; in Europe, the goal is 20 mph). Although 25 percent of cars exceeded the speed limit, none went faster than 37 mph.

However, perceptions of people on the street are quite different: 59 percent of transit riders surveyed believed that cars drove too fast, as did 47 percent of merchants and 39 percent of pedestrians surveyed. This may be because of the large volume of traffic rather than its speed.

Because extensions are located at intersections without signals, potential delays to vehicles forced to wait for buses to load/unload *and* for the signal to change are reduced. At the same time, a loading bus naturally slows traffic behind it. A rhythm is created by alternating intersections: one with traffic lights, the next with a bus stop, and so on. This helps to regulate traffic flow and to control traffic speed. However, because the bus runs only every 9 to 12 min, the effect is intermittent.

It is also important to emphasize that because buses load more quickly from the extensions, delays to automobiles are also minimized. Indeed, there is more congestion at the traffic lights than at the bus stops. During peak periods, many cars do not get through intersections during one light cycle, even when there is no bus present. Also, although buses add some congestion to the area, they carry many people who otherwise might be in cars.

One of the major traffic problems facing NW 23rd Avenue before the extensions was illegal passing; cars caught behind a loading bus would pull out around or turn in front of it. Illegal passing and turning in front of loading buses has been curtailed because the bus now stops squarely in the middle of the lane; some drivers still try to get around them but it happens less often (Figure 3-3). Illegal parking at bus stops has also been greatly reduced.

Pedestrian Impacts

The extensions have alleviated but not totally eliminated sidewalk conflicts. This is because the design and arrangement of amenities on the extension—including bus shelters with their open side facing the sidewalk—do not encourage people to wait on the extension. Indeed, the only bench is inside the shelter. As a result, many people still wait on the sidewalk.

The relatively slow speed of traffic, the degree of congestion, and the narrow street (made even narrower by the extensions) make it easy for pedestrians to cross the street. Crossing against the light and jaywalking between intersections is quite common and is, in some ways, an indication of the relative comfort of the street. The parking lanes also act as buffers between traffic and pedestrians. Over 75 percent of merchants, transit riders, and pedestrians surveyed agreed that NW 23rd Avenue is a pleasant place to walk.

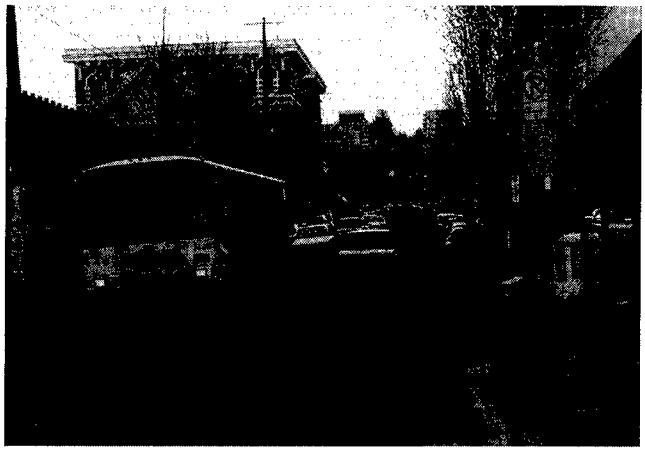


Figure 3-3. Curb extensions were added to NW 23rd Avenue to reduce illegal passing of loading buses by cars (above). Although the extensions are the length of a full-sized bus, when transit amenities block the sidewalk many drivers do not pull up all the way, which forces alighting passengers to disembark into the street (below).

Nearly 46 percent of pedestrians surveyed, however, reported that they thought it was difficult to cross NW 23rd Avenue. There could be several reasons for this perception. Currently, the only crosswalks on the street are located at signalized intersections, which forces pedestrians to jaywalk (or to *think* that they are jaywalking) even when they are crossing at an intersection. Many survey respondents also commented that they believed there was too much traffic on the street, and, as noted above, that traffic was too fast. These perceptions about vehicle impact show that more needs to be done to address pedestrian convenience in crossing the street and that additional traffic-calming measures may need to be introduced.

Economic Impacts

NW 23rd Avenue is becoming an even more vital retail corridor: the number of upscale shops has doubled and now includes restaurants, coffee bars, bookstores, pubs, and gourmet kitchen and designer clothing stores. Nearly one-third of businesses on the street have opened in the past 5 years. Recently, Pottery Barn moved into an old bank building; it is possible that more chains stores will move into the area, adding to the many locally owned establishments. Of businesses surveyed, 54 percent rated the street as an excellent place to do business and 43 percent said it was "good." Although the sidewalk extensions did little to cause these trends, they make it safer and easier for people to use the street.

Businesses also view transit as a positive element. Of merchants surveyed, 45 percent agreed that transit contributed specifically to their business and 57 percent reported that transit was "important" to the *overall area* as a place to do business.

Costs

The cost of the 12 curb extensions was $325,000. Some of the moneys came from interstate transit dollars diverted from highway projects to street-enhancement efforts under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) legislation. The city funded its 15 percent share (ISTEA match) from gas taxes.

Conclusions

The bus stop extensions on NW 23rd Avenue are a small project conceived and implemented within a larger context of improving transportation options and the livability of the city of Portland. This overall vision, which is shared by the city and the transit agency, represents a crucial partnership that has given Portland its deserved reputation as a transportation innovator and a city that sets the standard for others dealing with the challenges of shaping urban growth. In this way, the NW 23rd Avenue project belongs not simply to the transit agency or the neighborhood but to the city as a whole.

Next Steps

Other transit improvements are being considered for the corridor as a whole. These include service improvements such as trolleys and circulators serving this location.

Tri-Met would like to introduce bulb-outs on the side streets and to move some of the amenities to that side of the extension, also serving to shorten pedestrian crossings. Tri-Met is now trying to implement Americans with Disabilities Act (ADA) requirements that both bus doors open onto the curb extension and that transit shelters be placed between the doors.

To improve transit efficiency, the city is also studying the feasibility of a comprehensive TPS program throughout the city of Portland. This program is focusing mainly on bus stop

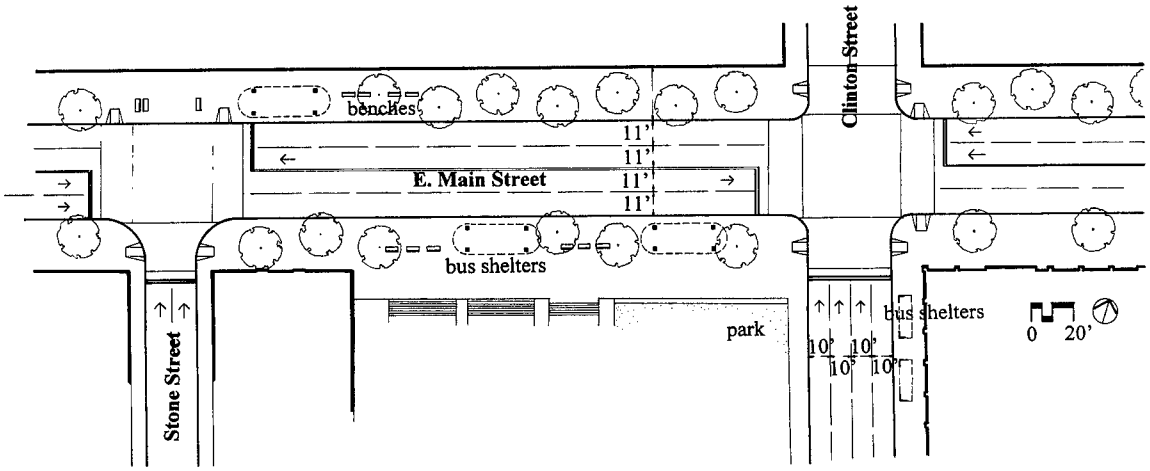


Figure 3-4. Main Street, Rochester, New York.

location and on prioritizing signals for buses, but future sidewalk extensions are anticipated as well.

Lessons Learned

- The project is simple but not as simple as it looks. Still, it is more economical and faster to implement than other major capital projects.
- The viability of this approach for other streets depends on many factors: current vehicle use, frequency of buses, number of transit riders and pedestrian usage, and cost of construction all need to be considered before proceeding.
- Consider not just the extension but the size and arrangement of amenities on it, as this will influence how and whether waiting bus passengers actually use it.

■ CASE STUDY 3-2: MAIN STREET, ROCHESTER, NEW YORK

The Main Street project instilled pride in the community . . . it began to change attitudes towards and the feel of downtown and increased the level of safety of people downtown.

—William Evans, Director of Evaluation and Development, Rochester-Genesee Regional Transportation Authority

Home to major corporations like Kodak and Xerox as well as renowned cultural institutions like Eastman Theater, downtown Rochester is a primary economic center for the city, with some 40,000 employees commuting there daily. The importance of Main Street as the city's historic retail district has diminished in recent years, as department stores have closed and retail business has moved to suburban locations. Main Street's role as a major transit hub, however, has increased, as nearly all bus routes in the city converge there (Figure 3-4). In addition to serving as a downtown destination, Main Street is also a transfer point for thousands of riders daily.

The primary motivation for redesigning Rochester's Main Street was to alleviate sidewalk congestion (Figure 3-5), which was negatively affecting area businesses and the quality of Main Street as a place to shop, walk, catch the bus, and work. The sidewalks along Main Street simply were not wide enough to accommodate the volume of transit users walking to and waiting for buses as well as the large number of pedestrians in the downtown area. Lacking adequate shelter as well, bus patrons often sought protection from the weather under store awnings and in business entranceways.

Figure 3-5. In the late 1980s, Rochester's Main Street was narrowed to four lanes, which provided room for widened sidewalks and extensive streetscape enhancements.

The original concept for Main Street was a transit mall with covered sidewalks, a solution deemed both too costly and, after visits to other cities with transit malls, inappropriate for a street with a still vital retail business. Instead, the city of Rochester and the Rochester-Genesee Regional Transportation Authority (R-GRTA)—working in partnership with the business community—adopted a plan to take advantage of the wide, underutilized street. Elaborate bus waiting areas and other pedestrian amenities were located on widened sidewalks, with the street kept open to private cars and commercial vehicles. Transit efficiency was addressed by making the two curb lanes for buses and right turns only; normal traffic was restricted to the two central lanes (Figure 3-6).

The project has greatly improved transit operations and the pedestrian environment, although pedestrian conflict areas persist where traffic engineers did not allow sidewalks to be widened (or where they could not be widened). Vehicular congestion is virtually nonexistent, in part because a bypass system around Main Street was also developed with the project. Unfortunately, shortly after the project was completed both downtown department stores closed, which precipitated a downward commercial spiral that continues today. Still, the project is a great source of community pride as witnessed by its rigorous maintenance, lack of vandalism, and improved rating by transit passengers. More importantly, the project sets the stage for the city's future economic revitalization and redevelopment.

Project Goals

The goal of the Main Street Pedestrian and Transit Improvement Project was, initially, to reduce pedestrian conflicts at bus stops and provide adequate sheltered waiting areas for peak-hour transit passengers who, for lack of an alternative, leaned against buildings and blocked store fronts and entranceways.

Other goals included the following:

- Correcting the imbalance between space provided for pedestrians and space dedicated to vehicles—pedestrian traffic was considered to be more important to the economic health of the street than vehicular traffic, yet it was afforded less room;
- Improving Main Street's underground infrastructure (which included decaying building vaults under sidewalks) as well as its physical appearance;
- Improving amenities for pedestrians and for transit patrons waiting for the bus;
- Improving the perception of safety and actual safety for passengers and pedestrians in the downtown area and making the area generally more "user friendly;"
- Diverting traffic onto a bypass loop to reduce Main Street's role as a traffic artery; and
- Creating a plaza on Main Street to serve as a gathering place and event venue.

Design and Planning Process

The Main Street Transit and Pedestrian Improvement Project began in 1976 as part of a downtown master plan completed that year. Included in the plan was a recommendation for formation of a downtown development group, the Rochester Downtown Development Corporation (RDDC), and an extensive series of public and private improvements to Main Street. By the early 1980s, implementation of the plan was under way, with a new convention center, hotels, and office structures under construction.

In 1978, the city of Rochester asked the transit authority for a concept plan outlining how transit should serve and be integrated into the downtown area. The initial plan called for a transit-only mall flanked by covered sidewalks extending for blocks on both sides of the street; the local business community reacted strongly against this plan. This input from the business community, and the ensuing dialogue about the future of transit in Rochester that it engendered, led to development of a more refined planning and engineering process and, ultimately, the concept for street and pedestrian improvements. All agreed that transit service should remain centrally located (on Main Street) and were in favor of pedestrian improvements to solve congestion at stops. Wider sidewalks, for example, would allow free movement of passersby and provide adequately for the large groups of waiting passengers huddled against buildings. These improvements were constructed between 1987 and 1989.

Design Features and Strategies

Rochester's Main Street has maintained its mixed-use character but with greatly augmented pedestrian amenities and improved transit service. The street redesign involved reducing the roadway from six lanes to four; the additional lane on either side of the street was turned into expanded

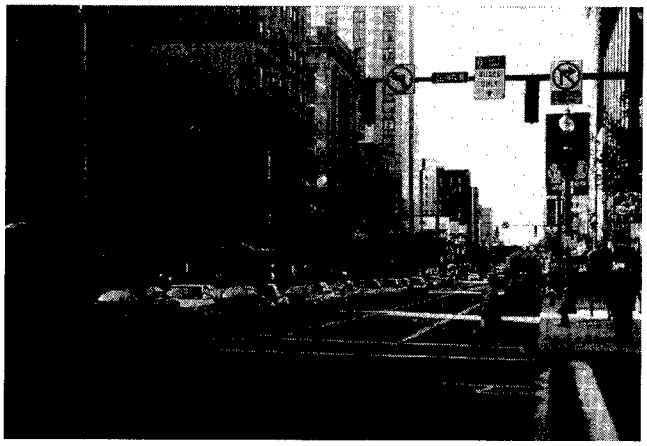


Figure 3-6. The dedicated bus-only curb lane is identified by signage at each intersection.

sidewalk space. Local car access continues to be allowed, but through traffic is encouraged to use bypass streets.

The R-GRTA established that, according to their counts, there was not enough traffic on Main Street to support or necessitate six lanes of traffic. Parallel street work was done at the same time as the Main Street improvements, creating a bypass that easily absorbed the traffic from Main Street. This made it possible to transform Main Street into a 50-ft-wide, four-lane street with two dedicated curbside bus-only lanes (also used for right turns) and two moving vehicle lanes, with left-turn lanes at key intersections. Sidewalks were widened to provide more space for pedestrian circulation and amenities, including elaborate heated transit shelters, trees and planters, improved lighting, and benches.

Located along the sidewalks are 19 heated glass and granite frame shelters, which serve about 40 bus routes. The largest of these is 40 ft wide by 100 ft long, serving the transfer area at Main and Clinton Streets. Unfortunately, sidewalks at intersecting streets to Main were not widened and, therefore, less elaborate shelters were constructed.

A key component to the project was the agreement of the Main Street business community to form a benefit assessment district for Main Street that would fund maintenance and capital repairs for the entire project. Fees are based on proximity to and building frontage along Main Street and cover daily cleaning of all of the amenities, litter removal, and flower plantings. In addition, local companies have made private contributions to the project: Bausch and Lomb commissioned an artist to create a custom railing for the Main Street Bridge where it crosses the Genesee River.

Impacts and Assessment

Transit Impacts

There is no question that the Main Street improvements have made transit service more efficient and comfortable for Rochester's transit patrons. Surveys conducted for this study were compared with passenger and pedestrian surveys conducted in 1983 as part of the planning for the original Main Street redesign. At that time (before construction began), only 45 percent of passengers rated bus frequency and service reliability as good or excellent (up by 17 percent in 1996). Waiting conditions at bus stops were considered to be good or excellent by only 29 percent of passengers (up by 18 percent in 1996), and only 44 percent considered drivers to be very courteous (up 22 percent in 1996). In 1983, 60 percent of transit riders said that the proximity of bus stops to downtown destinations was good or excellent; this number increased to 78 percent in 1996.

The bus lanes have improved transit efficiency, as they allow buses to remain in the curb lane—without having to pull in and out of traffic to pick up or discharge passengers. Although the bus lane generally works well, there are frequent incursions by delivery vehicles and cars picking people up in front of Main Street buildings. The bus-only lanes are not adequately demarcated: there is a small sign attached to the mast arm of the overhead traffic signal, but there are no painted diamonds in the lane and there is no double white separating line. The once rigorous enforcement of bus-only traffic is now erratic.

Before construction, the R-GRTA was criticized for platooning buses in long lines along Main Street to facilitate the transferring of passengers (Figure 3-7). Today, the platoons have been largely eliminated during the day without negatively affecting passenger service. During the evening, however, the transit lane is used by buses for parking and layover with as many as 15 buses lined up along each side of Main Street. This poses problems for police, who cannot see the sidewalks because the buses block the view. It is also intimidating for pedestrians.

Pedestrian Impacts

With wider sidewalks and bus patrons given adequate space, it is easier for people to walk along Main Street. However, compared with the other case studies, this street rated lowest as "a pleasant place to walk." This probably is due to the loss of retail business in the area and the many empty storefronts that line the street. Also, although 73 percent of pedestrians and merchants agreed that Main Street was easy to cross, only 53 percent of transit riders, many of whom have to cross Main Street to make their transfers, agreed.

Pedestrian-transit rider conflicts persist, however, but mainly on side streets such as Clinton and St. Paul, where the sidewalk width was constrained by the number of travel lanes determined by the city's traffic engineers to be necessary at the time. At these heavily used stops, the sidewalks have not been widened and smaller transit shelters without seating are provided, which do not work as well for passengers as do the full-

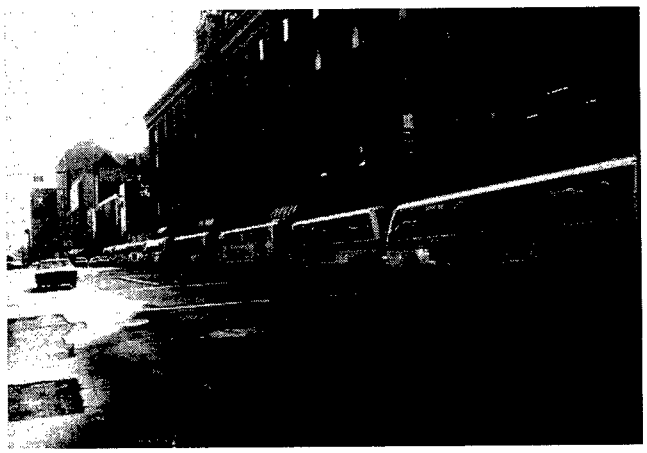


Figure 3-7. Before the Main Street improvements, buses lined up to facilitate passenger transfers.

sized shelters. Pedestrians must filter through the transit shelters to walk along the street. At these bus stops, only 47 percent of transit passengers surveyed rated the ease of walking to the stop as good compared with 69 percent of patrons who waited on the widened sidewalks along Main Street. They also rated the overall waiting conditions at the shelters on Clinton and St. Paul Streets lower; only 29 percent said that conditions were good compared with 60 percent of patrons who used the shelters on Main Street (Figure 3-8).

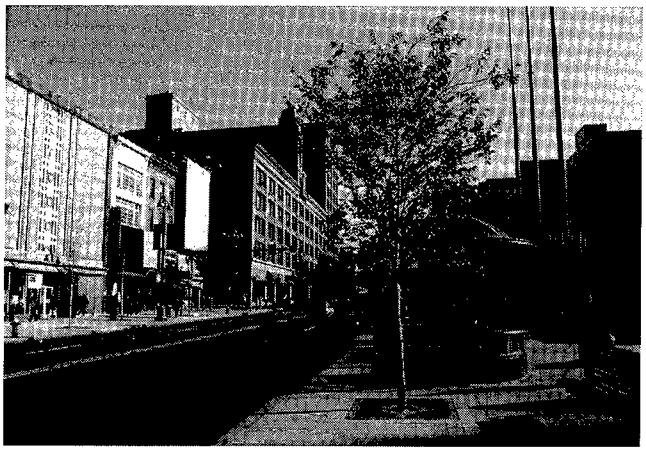


Figure 3-8. After the improvements, widened sidewalks and transit shelters now provide areas for passengers to wait.

Traffic Impacts

Traffic volume reductions on Main Street happened immediately once driving patterns changed because of the street's reconfiguration. For example, daily volumes on Main Street east of South Avenue in July 1981 were 19,723. In May 1989, after construction was completed, the number plummeted to 8843. On Main Street east of Exchange Street, daily automobile volumes were 19,990 in May 1985 (before construction) and dropped to 14,927 by July 1991 (2 years after construction).

However, volumes have increased over time. Daily traffic volumes on Main Street east of South Avenue reached 12,219 by July 1991 and those on Main Street at Exchange Street were back up to 16,612 by 1995. Many drivers found that Main Street, with fewer cars traveling along it, was faster to use than the bypass street. Still, volumes are significantly lower than before the Main Street improvements and bypass loop were introduced.

In addition, there have been other benefits. The number of bus-bus collisions has decreased dramatically and there are fewer collisions overall. The police and fire departments had feared that the plan would reduce travel lanes to the extent that there would not be room to transport emergency equipment but this problem never occurred.

Economic Impacts

The majority (54 percent) of Main Street merchants surveyed have been in their present location for at least 6 years—since completion of construction. They were evenly divided on whether Main Street was a good or a fair place to do business (36 percent each). Eighty percent said that more than one-half of their customers walk or take transit to their business. Not surprisingly, 46 percent rated transit service as very important to their business and 55 percent rated it as important to the overall area as a place to do business.

The project generally has achieved the goal of providing enough space for people to wait for buses so that they no longer block storefronts. During the redesign, however, one very heavily used bus stop was divided into two separate stops. Unfortunately, most transit riders relocated to only one of these stops, which is too small to handle the volume of passengers who use it. Observations showed that only 50 percent of patrons waited within the designated bus waiting area (shelter and adjacent benches); the other 50 percent waited in front of the adjacent storefront and entranceway. One restaurant claimed that this was the main reason it closed, and the manager of the adjacent drug store reports declining sales despite improvements to store operation and design.

Although a better balance between pedestrians and vehicles has been achieved, the Main Street project has not lived up to broader expectations of economic development. The two major downtown department stores closed shortly after construction ended and many storefronts are vacant, despite the opening of a new hotel and convention center. This change in the character of the street is not directly attributable to the street design (though some blame the disruption caused by construction). One department store was acquired by another chain store that subsequently closed. The building where this department store was located has taken on new life, however, and is now being used as the downtown campus of a community college. At the same time, the public-private partnership that initiated the Main Street project went on with revitalization efforts in other parts of the city, and today the partnership recognizes the need to refocus energy and investment on Main Street.

Costs

The project was funded largely with federal and state assistance; in 1984, $18.5 million in grants were given to the city for construction and implementation of the project. Rochester also received a block grant (now Section 9 formula aid), and Section 3 discretionary money was committed by the FTA. The project qualified for this scarce FTA money because it had bipartisan and public/private support.

Conclusions

Rochester's Main Street now provides a much improved environment for transit riders and pedestrians. This renewal has been achieved without negatively affecting automobile traffic and it has made transit operations more efficient. Still, problems with specific bus stop locations remain and need to be addressed. Moreover, a new revitalization strategy is required to build upon the success of Main Street and take advantage of the attractive setting that has been created.

Next Steps

Proposed next steps being discussed by the city and by R-GRTA for Main Street include the following:

- Revisit and fine-tune all the circulation issues. For example, turns on and off Main Street are tolerable after hours but are more difficult during rush hours.
- Rethink use of the bus lane during off-peak hours. Experiment with allowing on-street parking on Main Street after 7 p.m. and on weekends to attract people downtown to dine, go to the theater, and shop.
- Redesign problem bus stops—changing transit operations and widening sidewalks, if possible, to alleviate congestion—or relocate bus stops to more appropriate places.
- Develop a revitalization plan to redevelop vacant and underutilized buildings on Main Street.

Lessons Learned

- Do not close a street to cars. Instead, provide a mix of transit and vehicle use.
- Integrate planning with other planning efforts. Significant downtown developments that would tie in with Main Street did not occur after construction.
- If you are not prepared to maintain it, do not do it. If community expectations have been raised to a higher level and you do not keep it up, the community begins to lose respect.
- Make it a community effort. Cooperation of business and government is important to the success of any project.

■ CASE STUDY 3-3: UPPER MARKET STREET, SAN FRANCISCO, CALIFORNIA

You need to consider the balance of traffic, transit and pedestrians. The lesson is if you exclude one of those elements from a community, or you put it in the wrong place, or you give too much turf to one mode or another, you'll have a problem. But if you get the right balance, you'll be successful.

—Focus group participant

Market Street has always been San Francisco's main street as well as its transit spine. At its westernmost end lies the Castro District, one of the city's more vibrant and diverse neighborhoods. The street is lined with restaurants, bars, cafes, and shops offering everything from body piercing to antiques. Like NW 23rd Avenue in Portland, the street has human-scaled architecture—and high traffic volumes and transit usage. Unlike NW 23rd Avenue, however, the street is very wide.

In the 1970s, Upper Market (the section of Market Street above Van Ness) was "beautified" with new sidewalks, historic-style street lamps, street trees, and transit shelters for trolley coaches after the Bay Area Rapid Transit (BART) system and the MUNI subway were constructed underneath. The street remained a wide thoroughfare dominated by automobiles, however, with a narrow median ringed by a chain-link fence to prevent jaywalking. In 1983, a nonprofit group that collects and restores vintage streetcars from around the world began hosting an annual streetcar festival in conjunction with San Francisco Municipal Railway (MUNI), which featured restored streetcar service on Market Street's deteriorated track. The festivals became increasingly popular over the years and inspired the idea of permanently restoring streetcar service to Market Street.

The Market Street Transit Thoroughfare project, as it is known, combined development of the streetcar right-of-way with additional pedestrian and traffic improvements. Presidential Conference Committee (PCC) streetcars, purchased primarily from Philadelphia and restored by MUNI, now travel in a mixed-traffic lane along a newly rebuilt Upper Market Street, which also features a bike lane and a median planted with Canary Island palm trees. Completed in 1995, the F Line extends to Lower Market Street and will eventually continue to Fisherman's Wharf along the Embarcadero.

Today, Upper Market Street helps to knit the neighborhood together. The streetcars have become, in a very short period, a beloved community institution as well as viable and successful transit vehicles. Although some pedestrian conflicts at intersections remain and more could be done to calm traffic, the project represents a shift away from automobile-dominated thinking, which is integral to the city of San Francisco's "transit first" policy.

Project Goals

The Upper Market Street project was not a single project driven by a single planning process or goal. Rather, the street was redesigned incrementally over time, building on earlier decisions and through continued negotiations over the configuration, function, and balance of uses appropriate for such an important transportation artery.

In the 1960s, the goal was to remove transit from the street and to provide more space for automobile use. This vision was held until the early 1970s when Market Street was radically redesigned to make way for the regional

heavy-rail system (BART). All light-rail transit was relocated underground along with BART, which freed up the street for automobiles.

In 1973, this "automobile-only" approach was replaced by a "transit first" policy that gives public transit priority over automobiles on city streets. This signaled the start of the incremental reclaiming of Market Street by transit—first with buses and trolley coaches and most recently with the F Line streetcars. Meanwhile, underground transit alone, although faster, was not able to keep up with the transit demand or to adequately serve local destinations. Building on the success of the historic streetcar festivals and recognizing the need to relieve overcrowding on the subway and cable car systems, the San Francisco Municipal Railway decided to restore the existing right-of-way and create the new F Line streetcar line.

This initiative, which necessitated rebuilding the street to accommodate the streetcars, was able to address other goals as well. At the outset of the project, the community voiced a desire to make the street more attractive, by upgrading the street median, and to create a new image for the distinctive Castro District. Area businesses promoted the idea of a median as a means of tying the two sides of the street together to create a unified retail presence, strengthen local businesses, and facilitate pedestrian crossing (and shopping). The city wanted to use the project to enhance traffic efficiency, particularly at key congested intersections, and certainly did not want the introduction of streetcars in any way to disrupt traffic flow or diminish traffic capacity. Adding to the final complexity of the project was the desire of bicycle advocates to create designated bike priority on the street.

Except for the introduction of a median to help facilitate pedestrian crossing and access to transit islands, the Market Street project did not have explicit pedestrian goals in mind, in part because the beautification program that took place in the 1970s was presumed already to have addressed these concerns. In fact, only minimal changes to the sidewalks were made during construction of the F Line. Also, although the project was part of a general revitalization strategy for the Castro District ("to improve Market Street"), there was no community-based strategy for guiding the development of the street or for sustaining its economic vitality during and after construction.

Design and Planning Process

By the time the F Line project came along, earlier projects, which continued to favor cars over transit, already were in place. For example, gas stations and supermarkets built as part of redevelopment efforts in the 1960s were geared toward the convenience of the automobile; these design features, coupled with their prominent corner locations, continue to inject elements of suburban sprawl into this fairly dense urban area.

During the long process of designing the F Line, a veritable battle was waged over the mix of uses on the street; the balancing of these uses; and the apportioning of street space, lane widths, and median size. In fact, apportioning the street literally came down to a matter of inches. At the beginning, one faction argued for a designated transit lane and a single traffic lane in both directions. The community wanted two moving travel lanes in each direction, whereas the city's Department of Public Works (DPW) wanted three. Friendly tension existed as well between MUNI and city traffic engineers, with the former interested in making transit work better and the latter concerned with making automobile traffic flow more smoothly. The resulting plan represents a compromise of all these divergent interests.

Those involved in the design of Upper Market Street included the Mayor's Advisory Committee on Upper Market Street, DPW, community groups, including a coalition of bicycle advocates, the San Francisco Municipal Railway (MUNI), and area merchants. In the mid-1980s, during the conceptual design stage, MUNI invited the community to participate in discussions about the F Line alignment, location of stops, and the terminus. Public comments were included in the recommendations finally approved by the city's Public Utilities Commission (of which MUNI was a part at the time of this project).

During the design and construction process, MUNI met with merchants and worked with them on traffic rerouting strategies that would mitigate the effect of construction on their businesses. MUNI staff attended the merchant group's monthly meetings to update them on construction progress and to help resolve problems. MUNI representatives also attended separate meetings with area residents who were concerned about the noise and vibration of the streetcars. Other types of outreach programs mounted by MUNI included publishing a newsletter and brochures. When the palm trees were installed and the central medians were planted, a palm tree celebration was held to show that progress was being made.

Design Features and Strategies

The final scheme for Upper Market Street (Figure 3-9) includes the following:

- Two 11-ft moving lanes—one of which is shared with streetcars;
- A 10-ft parking lane;
- A 6-ft-wide bicycle lane between the parking and vehicle lanes, which tapers at intersections with boarding islands so that cyclists rejoin traffic as they travel through the intersection;
- Boarding islands for transit riders; and
- A landscaped median with 20-ft-tall Canary Island palms and specially designed pavers that make jaywalking difficult.

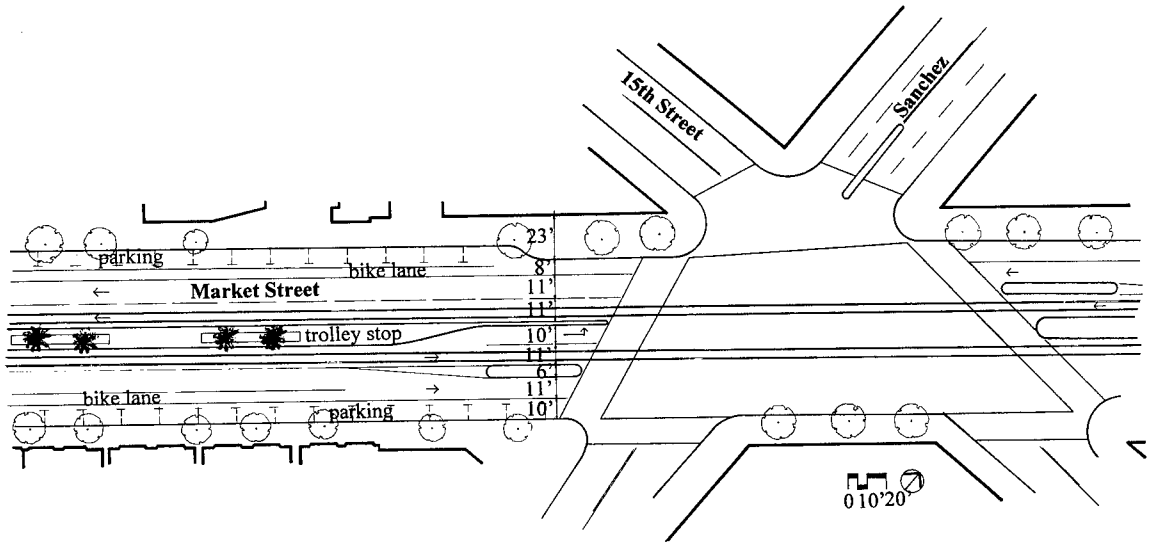


Figure 3-9. Upper Market Street, San Francisco, California.

Today, seven transit routes serve Upper Market Street, composed of streetcars and rubber-tired electric trolley coaches and with MUNI subway trains running underneath the street. Benches, trees, and widened sidewalks built in the 1970s remained unchanged. However, bright-blue light poles, called "path of gold" poles, which historically held up the trolley wires, were reinstalled along the length of Market Street.

Boarding islands were designed to be wheelchair accessible and feature a permanently installed ramp to raise passengers to the height of the streetcar. Some boarding islands are outfitted with leaning rails, simple shelters, and flip-down seats; others have only leaning rails. In addition, plaques with poetry were commissioned by the San Francisco Art Commission and are embedded in boarding islands all along Market Street.

A simple, transit-priority signalization system was introduced that is geared to the speed of streetcars (Figure 3-10). Streetcars reach the intersection as the light turns red, which allows passengers to board and alight during the red phase of the traffic signal. A 10-mph zone was established in the areas adjacent to the transit islands (to be in force when streetcars are stopped at the island).

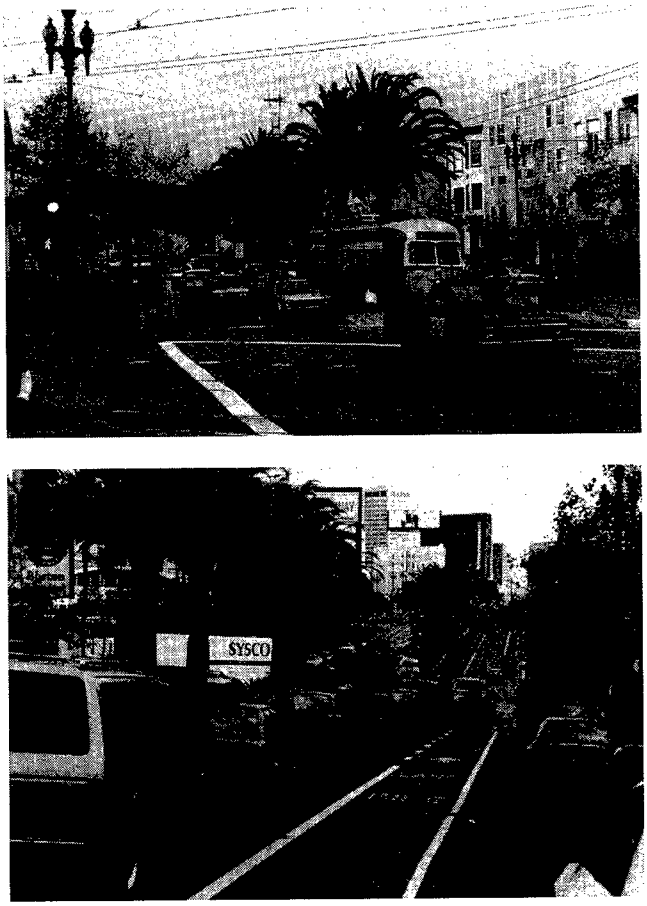


Figure 3-10. The transit signal priority system on Upper Market Street allows for passenger boarding during the red cycle of the traffic light (above), while causing little delay to cars traveling in the shared transit lane (below).

Impacts and Assessment

It generally is agreed that the Market Street Transit Thoroughfare Project improved the character of Upper Market Street, bestowed a "sense of wholeness" to the street by bringing both sides of the street together, and unified diverse aesthetic and design elements. The palm trees and median treatments, although initially controversial, ulti-

Figure 3-11. An overview of Upper Market Street shows how the street is distributed among uses.

mately have been well received; the street's appearance has been greatly improved and the streetcars are widely praised (Figure 3-11).

Transit Impacts

The improvements have helped establish a priority for transit and the historic streetcars, which has given transit a stronger presence in the area. The F Line streetcars have enormous visibility and function efficiently. Ridership on the F Line has nearly doubled (from 5000 to 9000 per day) compared with the previous trolley coach that served the same route. In addition, nearly all passengers surveyed at the F Line stop adjacent to the Castro Street MUNI subway entrance who had a choice of taking the F Line or the MUNI subway reported choosing the F line over the subway because the streetcar was more comfortable, less crowded, and more charming. Finally, 75 percent of pedestrians surveyed said having streetcar service and stops on Upper Market Street makes them more likely to take transit, and 20 percent of those surveyed had used the streetcar to reach the street that day.

Participants in focus group discussions stated that the streetcars "make them happy," "are darling," and F Line drivers are among "the most courteous in the city." Patrons in wheelchairs like the F line as well because the streetcars are easily accessible: the portable folding metal bridge that drivers store behind their seats provides easy access from the median's handicapped ramps onto and off of the streetcar.

Although the transit boarding islands are functional, few offer amenities such as seating and shelters, and focus group participants commented that these amenities "appeared to have been selected out of a catalogue rather than chosen to complement the historic streetcars and streetscape design." Furthermore, the leaning rails are too high for comfortable leaning. Of passengers surveyed at F Line stops at Noe, Castro, Church, and Sanchez, 67 percent rated their transit stop "good" for overall attractiveness, but only 43 percent gave a "good" rating for overall comfort. Fully one-half of respondents questioned wanted improved shelters with walls and roofs as well as route maps and schedules at transit stops.

Although 67 percent of passengers surveyed agreed that it was easy to walk to the boarding islands, focus group participants complained that the intersections at streetcar stops are hazardous (Figure 3-12). This may be because transit riders do not always wait for the "walk" signal to exit the island, especially if they are headed for the nearest sidewalk, and because the 10-mph zone at transit islands is neither enforced nor observed (Figure 3-13).

Traffic Impacts

Market Street is a major traffic artery. In May 1990, 21,834 cars traveled daily (over a 24-hour period) westbound on Market Street and 17,757 vehicles traveled eastbound. In September 1994, this number had fallen to 15,399 vehicles westbound and 16,584 vehicles eastbound on a daily basis. It is difficult to assess the effect of the project on traffic, in part because closing of the central freeway after the 1989 earthquake changed people's driving patterns and, in part, because data for the years after opening of the F Line (late 1995 to the present) are not yet available.

In general, however, the shared vehicle-transit lane works well, because transit vehicle volumes are low and traffic signals are timed to the streetcar, which minimizes delays to automobiles. There appears to be very little congestion at any time, with most cars getting through the intersection on one signal and with the streetcars generally moving at the same speed as the cars (25 to 30 mph).

Because the 10-mph posted speed limit (in effect when a streetcar is actually stopped at a boarding island) is

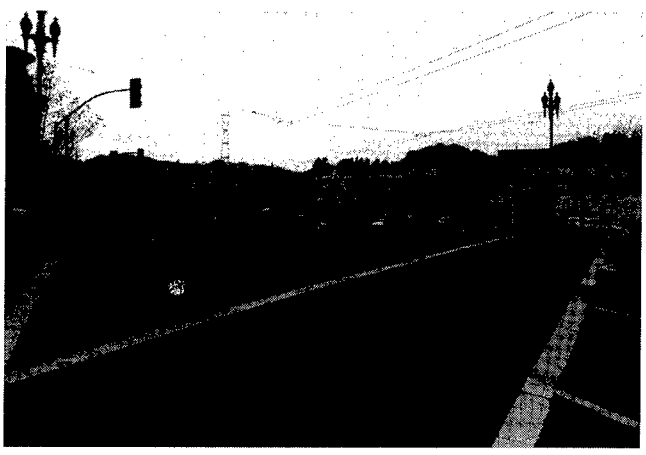


Figure 3-12. Pedestrians do not feel that the street is easy to cross, even with the addition of a landscaped median.

Figure 3-13. Enforcement of traffic rules on Upper Market Street is lacking, which makes the street work less effectively for pedestrians and transit passengers.

neither observed nor enforced, a hazardous situation is created for transit riders. Impact barriers at the end of the islands were installed as an extra safety measure; the frequency with which these are hit suggests that additional measures are needed to reduce speeds at these points. There also have been a number of automobile-streetcar collisions.

Finally, the design of the bike lane has had some unexpected effects on the street. The width of the bicycle lane (6 ft) adjacent to the parking lanes (10 ft) provides sufficient room for cars to double-park without affecting the moving traffic lane. Trucks also unload and load in the bicycle lane, which also blocks it for cyclists (Figure 3-14).

Pedestrian Impacts

The previous street beautification efforts and sidewalk designs dating from the 1970s did not adequately address pedestrian crossing issues. As a result, the project has been less successful with regard to pedestrian orientation, and the general sense is that the automobile is still dominant, although not as much as it was before the project was constructed. Almost 50 percent of people surveyed, including pedestrians, transit passengers, and area merchants, thought that cars drive too fast. In addition, 20 percent of all accidents that occurred along Upper Market Street between 1986 and 1995 involved pedestrians.

Intersections are especially problematic. They are difficult to cross because they are wide and in some cases lack crosswalks or the crosswalks are indirect, which encourages jaywalking. Vehicular turning movements where several streets converge also can be confusing to pedestrians. Only thirty-three percent of pedestrians surveyed said that Upper Market Street is *easy* to cross.

Traffic signals have long intervals, forcing pedestrians to wait over a minute before crossing the street. The pedestrian crossing signals across Market Street at both Noe and Castro provide a 15-second "walk" signal with a solid "don't walk" signal for a full 45 and 65 seconds at each intersection, respectively. The average pedestrian cannot make it across the street in 15 seconds. Although an additional 30 seconds is provided to complete the trip during the flashing "don't walk," pedestrians are psychologically hurried and given the message that they might not make it across the street before the light changes. The median provides a refuge but the intersection would be more effective with a longer light cycle for pedestrians.

At 15 feet, the sidewalks along Upper Market Street are just wide enough for a modest amount of seating, displays, and other amenities; they are not wide enough for outdoor cafes, which undoubtedly would be popular in the neighborhood and would help enliven the street for pedestrians even more. Still, the colorful and attractive storefronts and vibrant street life contribute to the opinion held by 70 percent of all pedestrians, merchants, and transit riders surveyed that Upper Market Street is a pleasant place to walk.

Economic Impacts

The Castro District on Upper Market Street is home to scores of restaurants and specialty shops and is one of the more successful retail districts in the city. The construction process, designed to be incremental to reduce impacts, took its toll on area business, however. Only 5 percent of businesses surveyed have been in the same location for 6 to 10 years, and 31 percent have moved in the past 1 to 5 years (after construction). Working on one block at a time meant

Figure 3-14. Here a double-parked car blocks the bike lane.

that disruption was localized but in the end, construction took longer and cost more than was necessary.

Of those businesses that moved to the area within the past 5 years, a significant number are restaurants. Existing businesses had anticipated that the F Line would bring more tourists, and it has. However, they fear that as the customer mix changes (visitors and tourists instead of residents) so will the types of businesses that move in and, furthermore, that the businesses that do move in will be national chains that can afford higher rents. Such ventures could displace smaller, locally owned businesses that reflect the neighborhood and serve the community.

Costs

The total cost of the Market Street Transit Thoroughfare Project was $50 million, with Upper Market Street accounting for $18 million. This work was financed with funds from the half-cent tax for transportation improvements collected by the San Francisco County Transportation Authority, FTA Section 9 grants, and state Guideway funds.

Fully one-half of the costs were for *non*-transit related, street rebuilding improvements, such as utilities, sidewalks, street trees and furniture, reinstalling light poles, and reconfiguring the street. The other one-half went toward transit elements: the F Line track, the streetcars (including retrofitting the streetcars to meet ADA requirements), and boarding islands. International vintage streetcars continued to be purchased, restored, and turned over to MUNI by the Market Street Railways Company, the nonprofit organization that sponsored the streetcar festivals, which continues to raise funds for this purpose. The PCC cars in regular use were purchased by MUNI in 1991 and were rehabilitated at a cost of $700,000 per streetcar.

Conclusions

The general consensus is that the project was good for transit, the city, and the community. The F Line streetcars are becoming as well known, at least among San Franciscans, as the cable cars and have contributed to a new image for the Castro neighborhood. The fact that transit ridership has nearly doubled, compared with the previous bus line, also demonstrates public acceptance of a quality product and service. In the future, more can and should be done to Upper Market Street to continue the shift away from automobiles toward pedestrian and transit users.

Next Steps

The city is in the process of extending the F Line to Fisherman's Wharf along the Embarcadero to relieve tourist traffic on the cable cars and is taking some steps to guide new development so that it is more street and pedestrian oriented. With the dismantling of the central freeway, it is anticipated that both transit use and automobile traffic in the area will increase.

Lessons Learned

- An incremental, evolutionary approach is valuable, and it needs to be ongoing. "You can't expect that changes are going to last a hundred years."
- Do not prolong the construction period. Get in and get out quickly and provide more support for merchants during the construction process.
- Dialogue with the community early on in the process is critical but it is often difficult to maintain community interest over a long period of time.
- Enforce the law, such as speed limits and "no parking" regulations, or create environments and designs that are self-enforcing.
- A transit project cannot exclusively address transit needs; other pedestrian and traffic issues need to be addressed and improved as well.

■ CASE STUDY 3-4: MAIN STREET AND THE BLAKE TRANSIT CENTER, ANN ARBOR, MICHIGAN

We need to encourage people to spend more time downtown, not move through quickly. By widening the sidewalks or adding diagonal parking or taking a look at two-way traffic again, it would have some impact on the Blake Transit Center. People would think about it differently—not just as transportation but as a destination.

—Focus Group Participants

Ann Arbor, Michigan, is a quintessential university town with a population of 100,000, including a university population of 30,000. Whereas other midwestern cities have experienced suburban flight, the sizable student population has helped the downtown area sustain a strong pedestrian and transit orientation. Main Street, always the historic heart of the city, has received new vitality in recent years with reinvestment in the older commercial buildings and their adaptive reuse as retail shops and services. This investment was made possible in part by a 25-year commitment to caring for and preserving downtown as the city's prime retail corridor and historic center—a commitment that, by necessity, favors people over cars.

In the early 1960s, the city of Ann Arbor, Michigan, made the decision to revitalize Main Street by *not* turning it into a pedestrian mall, unlike many other midwestern cities, but rather to beautify it with streetscape improvements, thereby enhancing the pedestrian environment and keeping it open to traffic. Twenty years later, the city of Ann Arbor improved upon the design of Main Street to encourage sidewalk cafes, to enhance pedestrian lighting, and to reconfigure existing parking bays to make them more efficient. At the same time,

the city, through the Downtown Development Authority (DDA), began to extend streetscape improvements to the side streets east and west of Main Street to help create a downtown shopping district.

Transit services, at the same time, were growing and evolving. In 1987, the Blake Transit Center opened one block from Main Street, replacing street bus stops with a secure, comfortable, climate controlled terminal for passengers (Figure 3-15). The center disseminates transit information, reduces the necessity for passengers to transfer across busy Fourth Avenue by placing all the buses on the same side of the street, and, in general, creates a strong presence and identity for transit in the downtown area.

Today, Ann Arbor has a downtown where business is growing and transit ridership is increasing. Unlike other case studies, this result was not due to coordinated planning between the city and the transit agency, as both worked more or less independently but, fortunately, in pursuit of complementary goals. The city, business community, and transit agency have rediscovered one another and are now working to more closely integrate future efforts.

Project Goals

The goal of the various streetscape redesign programs, beginning in 1965, was to revitalize the downtown area, keeping existing businesses and attracting new ones (Figure 3-16). The goals of each project, however, were quite specific and tended to build on what came before. For example, the first Main Street redesign project in 1965 was developed, very simply, to plant trees on treeless Main Street, reduce the impact of traffic, and improve the sense of scale, structure, and pedestrian environment.

By the mid-1980s, Main Street had staged a comeback and was home to numerous restaurants, coffeehouses, and shops. The sidewalk extensions were used increasingly by these establishments for outdoor cafe seating; however, the cobra head lighting was not conducive to or adequate for these kinds of activities. The second project, which was funded by the city, was undertaken in the late 1980s to improve parking on Main Street, alleviate a parking shortage, and enhance street lighting for pedestrians (Figure 3-17).

Concurrently, the Ann Arbor Transit Agency (AATA) was pursuing aggressive strategies to improve service and ridership. The agency is one of the first to have purchased low-floor buses, which now constitute one-half of the fleet, along with shuttle vans and other special services. They have also instituted special fares and discount passes for students, senior citizens, and passengers with physical and mental impairments. The Blake Transit Center was constructed to improve customer service and comfort and to make transit operations (especially transfers) more efficient. It was also intended to increase the visibility of transit in the downtown area.

Because of their shared "customer first" approach, the goals of the city and the goals of the transit agency were ulti-

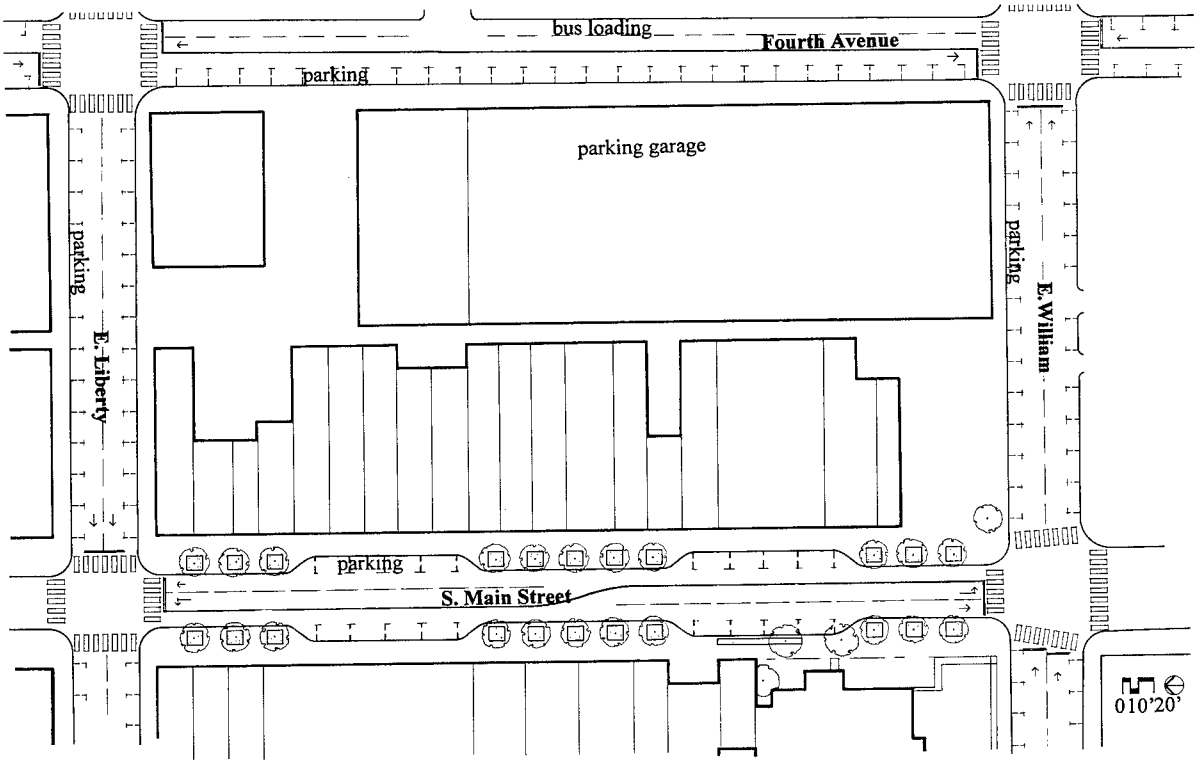


Figure 3-15. Main Street/Blake Transit Center, Ann Arbor, Michigan.

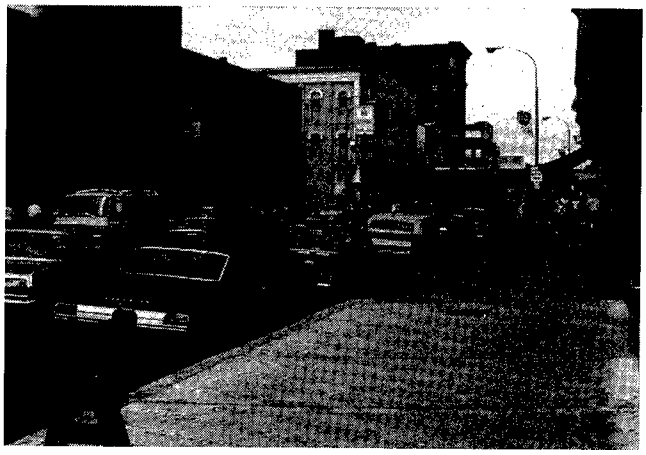


Figure 3-16. Ann Arbor's Main Street was transformed by the streetscape improvements introduced in the mid-1960s (above), which made room for outdoor cafes and other pedestrian activities (below).

mately compatible. Indeed, each was designed to make downtown Ann Arbor safer and more comfortable for pedestrians (including transit users) and more attractive as a place to shop. This caused the various projects to have a synergistic effect.

Design and Planning Process

The transit center and the Main Street streetscape projects were both part of a larger community development strategy aimed at enhancing the livability of downtown Ann Arbor.

The original planning for Main Street dates from the early 1960s, but it was updated in the late 1980s under the direction of a newly created DDA. The planning and design process for transit, including construction of the Blake Transit Center in the late 1980s, proceeded on a parallel track and was funded by the transit agency (with matching federal funds). During this time, however, the city (and DDA) and the AATA did work at cross purposes. For example, while the Blake Transit Center was being built, the city built an addition to an existing parking deck located directly across the street between William and Liberty Streets. Not until recently, when a new DDA board was formed that recognized the mutuality of their goals and those of the AATA, did the opportunity arisen for real collaboration among the AATA, DDA, and the city with the meaningful involvement of the community and local merchants in the design and planning process. A new street-lighting program, merchant promotions, and streetscape improvements have recently been implemented.

Until very recently, there also was no unified effort to bring downtown merchant groups together to maximize or to share resources, as they traditionally operated as separate entities. Even the DDA, which is part of city government, traditionally operated independently and had tended to focus on accommodating and creating more parking space for cars

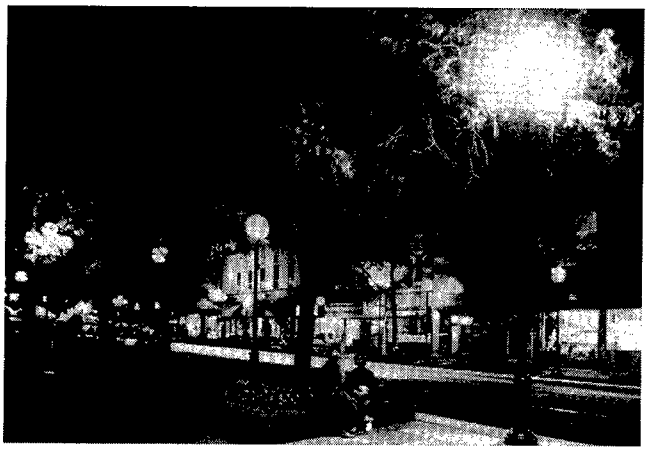


Figure 3-17. In the late 1980s, additional street lighting was installed on Ann Arbor's Main Street, which enhanced the visibility of stores and made the street safer and more comfortable for pedestrians (above). Main Street in the late 1960s (below).

downtown. Now, public/private partnerships are starting and downtown merchants are working with the DDA to promote local businesses, and with the AATA to determine how best to link the Blake facility to Main Street and to use transit as an alternative to building new (and repairing aging) parking garages.

Design Features and Strategies

As testament to an ongoing commitment to maintaining a walkable downtown, the first streetscape design improvements introduced in 1965 resulted in reducing a six-lane roadway to two wide lanes along with on-street parking bays and sidewalk extensions with trees and planters. In the early 1980s, these two lanes were narrowed and a continuous turning lane was introduced. In the late 1980s, lighting was redesigned and parking bays were reconfigured to make them more efficient. Also, several of the two-way side streets between Fourth Avenue and Main Street were upgraded with brick-paved sidewalks and pedestrian-scaled historic light fixtures.

Originally, transit buses traveled along 4th Avenue one block parallel to Main Street to the east, with bus stops located along the street. The Blake Transit Center consolidated these stops into one accessible location serving all the downtown bus routes. The heated waiting room is open every day, and the facility has rest rooms and transit information with transit passes and tokens for sale. There is a security presence there during operating hours as well. Seating and a change machine are available outdoors (Figure 3-18).

The DDA has been working with a newly formed business improvement district (BID), which encompasses the commercial district, including Washington, Liberty, South University, and North and South Main streets. The DDA collects tax money from property owners and provides services, such as pedestrian improvements, lamps, brickwork, and new trash cans. Merchants groups also pay for area security and maintenance.

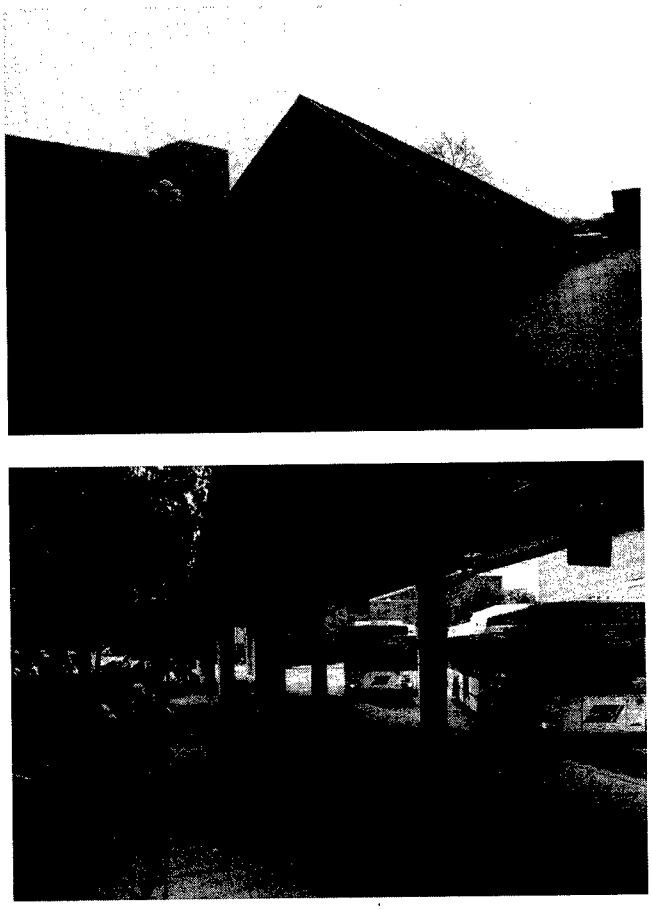


Figure 3-18. The Blake Transit Center opened in 1987, replaced on-street bus stops, and provided passengers with a climate-controlled waiting and ticketing area (above), as well as a safe place to lock bicycles (below).

Impacts and Assessment

The extensions, street trees, wide sidewalks, and improved pedestrian lighting have created much pedestrian activity along Main Street. Activity along Main Street was further boosted after the city revised its sidewalk use ordinance, which allowed store owners to use the space created by the sidewalk extension as outdoor seating areas.

Transit Impacts

A synergistic relationship has been created between the revitalization of Main Street and the use of transit in the downtown area. Whereas AATA has taken a number of innovative initiatives to increase ridership generally (working with major employers to offer their employees subsidized transit passes), the fact that downtown is a major attraction and is pedestrian friendly has been a contributing factor in the steady increase in transit ridership over the past decade.

The transit center improved the perception of safety for the area and helped make transit vehicle operations more efficient and increased the comfort of waiting passengers by providing one convenient, accessible transit center. Since the Blake Transit Center opened, it has functioned as an anchor for the area. For example, it is easier to provide security for one facility than for a series of stops along a street. As perceptions about Fourth Avenue have improved, new businesses are beginning to move to the area.

Although more could be done to improve the visual and design linkages between the Blake Transit Center and Main Street (continuous sidewalk paving, improved signage and street lighting), it is still convenient to Main Street shops and businesses.

Traffic Impacts

Despite increased pedestrian and retail activity on Main Street, with more stores opening and restaurants serving patrons late into the evening and on weekends, automobile traffic has not increased commensurably. In fact, it has remained relatively constant. In 1982, daily volumes along Main Street at Miller were 8,387 northbound and 8,508 southbound; in April 1995, volumes were 7,892 northbound and 8,999 southbound.

There are many reasons why traffic levels have not increased. First, the limited amount of parking causes people to seek parking off of Main Street (in parking garages) or to find alternative ways of getting to Main Street (transit, cycling, or carpooling). Main Street acts as a local street and motorists seeking the fastest way through town might choose to travel along Fourth or Fifth Avenue instead. In addition, many of the new patrons of Main Street are University of Michigan students who bike, walk or rollerblade, or take the bus.

The new street configuration appears to work well without creating traffic congestion. When the street was redesigned in 1965, it had two wide lanes with no center turn lane. To create the center turn lane (which helps reduce backups at intersections), the width of the two moving lanes had to be reduced. The street, therefore, has many elements for traffic calming: narrow lanes, two-way traffic, sidewalk extensions at intersections, paved crosswalks, and on-street parking. The traffic signals are timed for a maximum speed of 31 mph, but most cars travel slower than that. In addition, the activity created by all the streetscape measures—cafes, strolling pedestrians, colorful storefronts—further signals drivers to proceed more carefully through the area.

Not surprisingly, vehicle accidents have decreased in the area of the Main Street improvements. In 1985 there were 25 vehicle accidents at the intersection of Main and Miller, which was reduced to 12 in 1994; accidents at Main and Huron decreased from 21 to 17; and the intersection of Main and Ann had 8 accidents both years.

Pedestrian Impacts

Through the Main Street pedestrian improvements, a strong pedestrian orientation was created, including adequate circulation space; easy-to-cross streets; and many amenities that made the area comfortable, convenient, and desirable to use. The recent explosion in the number of outdoor cafes and significantly enhanced night lighting have made Main Street a veritable beehive of activity. Main Street is narrow enough and the walk signals are long enough for easy pedestrian crossing. The curb extensions at intersections (neckdowns) and paved crossings make crossing safer and curb-to-curb distances appear shorter as well.

There remains, however, a lack of pedestrian linkages and streetscape treatment of the streets between Main Street and Fourth Avenue in the area around the Blake Transit Center. Many of the same principles used on Main Street could easily be applied to these streets.

Economic Impacts

Because of an unusual 10-mile "radius-restriction" imposed by the owner of the nearby Briarwood Mall (in the 1970s when the mall opened), no "name brand" stores are allowed downtown if they are at the mall. As a result, local businesses got a foothold on Main Street, including bookstores, music stores, coffee shops, and bakeries. The restaurant business also is booming, having taken over vacant retail space from stores that had relocated to the mall; the boom was helped by the new street lighting that came on line in 1989. Even more new restaurants and outdoor sidewalk cafes have sprung up, stimulating a growing nightlife atmosphere. Art galleries stay open until 10 p.m. on weekends. Recently, a developer converted a former department store into loft apartments with ground floor and underground upscale retail shops. Next door, the ARK performance space has moved in over another restaurant.

Maintaining retail diversity is of the utmost importance, because the success of the restaurant business and single-use retail has caused commercial rents to increase, and new outer-edge commercial strip development continues to draw nonfood establishments away from the downtown.

Costs

The first streetscape project in 1965 was funded privately by Elizabeth Dean, who gave the city money to cover the cost of tree planting and maintenance. The fund is now managed by the city's Department of Parks and Recreation. Because this project occurred over 30 years ago, information about costs of these improvements is not readily available. In addition, were this information available, the cost in 1997 dollars would have to be determined. The second round of improvements to the area in the later 1980s, including the lighting and additional brick paving, was funded through local increment financing and totaled about $900,000. The money went to the DDA to pay for paving North Main, Washington, and Liberty Street sidewalks and for addition of new lighting along these side streets.

The redesign and construction of the Blake Transit Center was funded with Federal Aid Urban Systems moneys with a local match from the AATA; construction costs totaled $1.2 million.

Conclusions

Although these two projects were not planned jointly, their impacts have been complementary, and their successes are linked. Main Street is not only a popular pedestrian-friendly

place but an economic success as well. Furthermore, during the past 30 years, there has evolved an understanding of the role played by transit in preserving Main Street, in serving businesses and employees, in reducing the impact of the automobile, and in generally supporting the downtown area and development on Main Street.

Next Steps

The design and planning for future downtown streetscape and transit improvements is ongoing.

Next steps include the following:

- Connecting the Blake Transit Center to Main Street with streetscape improvements, including improvements on the streets around the center to slow traffic and to make it a more pedestrian- and transit-friendly destination; and
- Creating a central square around the library in the block adjacent to the Blake Transit Center as part of the library block development study.

The AATA is entering into discussions with the University of Michigan to create a bus, activity transit, and retail node on the campus and has plans to work more closely with the DDA, downtown merchants, and the university to coordinate transit service and reduce the need for construction of more parking facilities. For example, the DDA is encouraging other major employers in the area to develop dedicated shuttles between remote parking lots and their corporate offices downtown. AATA is purchasing 14 new 20-passenger vehicles, 5 of which will be used as downtown shuttles to carry passengers from AATA service lots located north, south, east, and west of downtown.

Lessons Learned

- The early pedestrian improvements and traffic constraints set the stage for what happened over a 30-year period. Although no one could predict what did happen, without these improvements, downtown Ann Arbor might have lost its cohesiveness and sense of place.
- Projects may have been done differently had there been a real partnership between the transit agency, the city, and the business community. The vision for a revitalized, pedestrian-oriented downtown was shared, but the implementation should have been better coordinated.

■ CASE STUDY 3-5: DAVIS SQUARE, SOMERVILLE, MASSACHUSETTS

It's hip to be in Davis Square.

—Boston Globe, January 26, 1997

Somerville, Massachusetts, the most densely populated streetcar suburb in New England, is home to 76,000 people. In 1973, Davis Square, one of the city's largest central squares and a traditional commercial center, was selected as the location for a new station on the Red Line T (subway), using a former freight rail line that bisected the community. While the station was being planned, the city and the community developed a visionary strategy to radically transform the streets and pedestrian access to the square, provide additional on-street parking, improve its visual appearance, and create opportunities for new development.

At the heart of Davis Square is a complex six-point intersection, consisting of four major collector roadways and two smaller roadways (Figure 3-19). Until their reconfiguration in the 1970s, two major, pedestrian-unfriendly streets bisected the square, and several freight trains ran right through the square each day on the Boston and Maine Railroad, forcing traffic to back up for long periods of time. While the Massachusetts Bay Transportation Authority (MBTA) was building the station and a new plaza, the city of Somerville set to work on construction of pedestrian-oriented streetscape and landscape improvements, facade renovations, and a redevelopment plan to attract new businesses.

Once a gritty, down-at-the-heels intersection, Davis Square is now a vibrant nightspot and popular shopping district. New restaurants and nightclubs attract a young crowd from all over the Boston area to what is billed as an alternative to Harvard Square in Cambridge. There are also many new professional offices and neighborhood-oriented services. Yet, the square retains its residential character and ably serves the needs of a diverse mix of residents. What has been achieved goes far beyond what the farsighted community envisioned when it began to plan the square's revival in the mid-1970s.

Project Goals

The 20-year revitalization of Davis Square has occurred, not as the result of one plan or initiative, but as a series of plans that have evolved over time as the needs of the area have changed. The square's success is attributable to the city's sustained commitments coupled with a very involved and energetic residential community. These parties wielded significant political influence in the city and were able to develop a long-term vision at a time when the area was suffering from the urban decay and disinvestment faced by many 19th century industrial, working-class neighborhoods.

The primary goal set forth in the Davis Square Action Plan adopted in 1982 was to use the new Red Line Station as a cornerstone for redevelopment, strengthening Davis Square as a viable shopping district while preserving the residential character of the neighborhood. After convincing the MBTA to route its Red Line extension through Davis Square, the city of Somerville then set out to improve access to Davis Square for pedestrians, cars, buses, and bicycles.

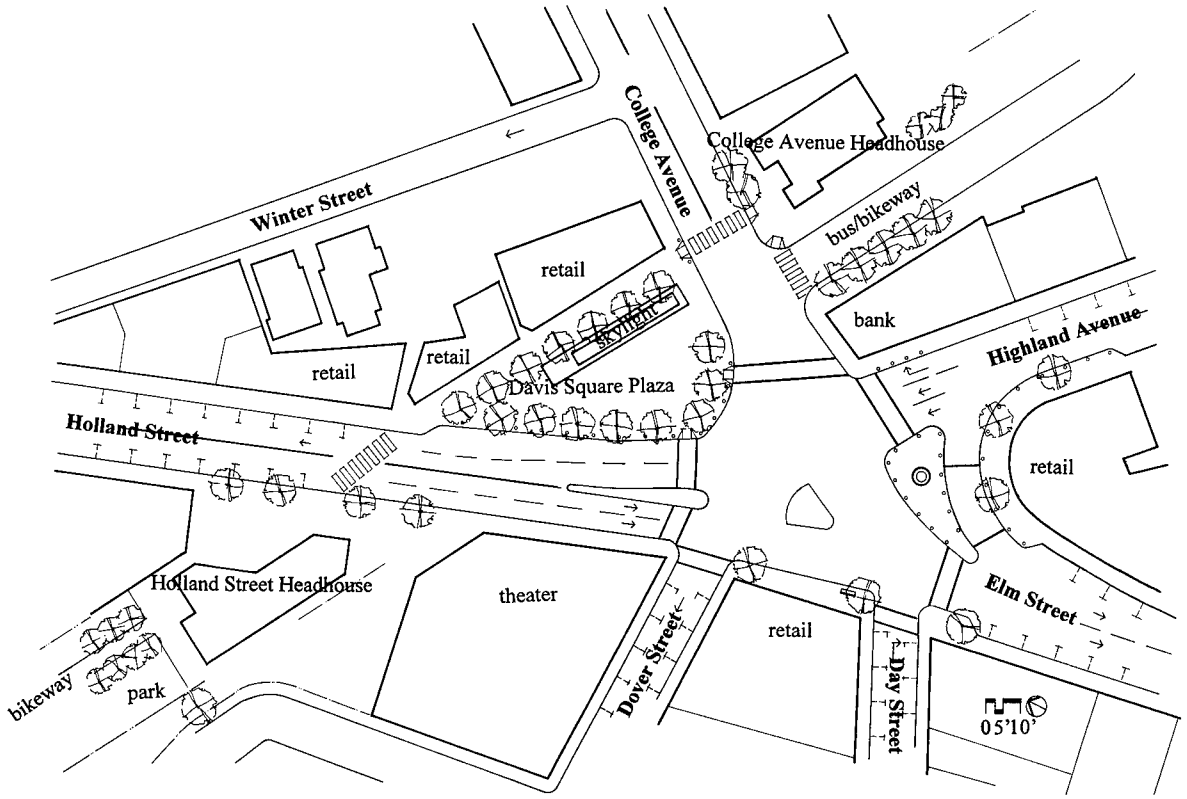


Figure 3-19. Davis Square, Somerville, Massachusetts.

In a planning study prepared by the city's Office of Planning and Community Development (OPCD) and its consultants in 1980 (Working Paper No. 5 of the Davis Square Planning Study), these goals were explicitly stated:

- Ensure pedestrian safety and convenience throughout Davis Square while minimizing traffic congestion;
- Design traffic patterns that promote the aims of the Davis Square business community;
- Provide safe and convenient pedestrian, car, and bus access to the (new MBTA Red Line) station; and
- Work with the MBTA and other agencies to appropriately reuse the railroad right-of-way.

Davis Square residents, in an effort to retain the residential character of their neighborhood, decided early on that the new Red Line Station should not provide any parking facilities, which they feared would destroy the character and human scale of their neighborhood. A 1989 Davis Square Parking Study further reinforced this basic commitment to reducing the number of vehicular trips to Davis Square as a way of reducing parking demand and relieving congestion.

Design and Planning Process

The OPCD and the Metropolitan Area Planning Council put together the first Davis Square urban design and business study in 1977, while the Red Line extension was in the planning stage. That same year, the Davis Square Task Force was formed; it was composed of members of the Ward Six Civic Association, local business owners, and local officials and was to act as an advisory committee. The task force provided input about the revitalization plans, addressed issues related to construction of the Red Line extension, and helped determine the character of new development in the square. The OPCD hired consultants to study potential land uses, including office and retail, traffic, parking, and other issues. The studies were generated as a series of working papers, termed the "Davis Square Planning Study." The findings of these studies, along with input from the task force, were synthesized for the Davis Square Action Plan, which was adopted in 1982.

To help resolve the traffic issues within Davis Square, a 1976 federally subsidized TOPICS (Traffic Operations Program to Increase Capacity and Safety) study was conducted. This study recommended that two of the square's major two-way streets (Highland Avenue and Elm Street) be converted to one-way and that intersection signalization be simplified. This led to 5 years of fast-moving traffic careening through the square and to what many residents decried as a very dangerous situation for pedestrians. "I can't cross the street" and "you take your life into your hands" were among the complaints that the city

heard from Davis Square residents. While planning the square's revitalization, the city and the Davis Square Task Force decided that, along with the major MBTA improvements to the square, measures had to be taken to mitigate the pedestrian-hostile effects wrought by the TOPICS program.

Finally, the city of Somerville and the Task Force initiated many other projects to accompany the Red Line extension and Davis Square improvements. Property redevelopment activities included a storefront and facade improvement grant program, financing for building renovations, and designation of a portion of Davis Square as an urban renewal district. Property acquisition, clearance, infrastructure upgrades, and development took place within the boundaries of this district. The district was later developed as a 100,000-ft^2 office and retail complex, including public open space and a parking garage that serves patrons and employees of local businesses.

Design Strategies and Features

The Davis Square intersection was radically reconfigured, with a plaza added between the subway station entrances as well as other pedestrian enhancements. Sidewalks, which average about 10 ft in width, were widened at intersections and at other strategic spots, particularly crosswalks, to enhance pedestrian capacity, circulation, and safety. The sidewalks, many of the crosswalks, and the pedestrian islands are brick paved and the crosswalks are clearly marked (Figure 3-20). Safety islands are provided at some intersections. On Elm Street and Highland Avenue, crosswalks and neckdowns are provided at midblock locations (to reduce walking distance between intersections for pedestrians) and large signs advise vehicles to stop for pedestrians in the unsignaled crosswalks.

The four collector streets—Holland Street, Elm Street, Highland Avenue, and College Avenue—average about 40 ft in width, with two travel lanes and parallel parking with 1-hour meters on both sides. Holland Street and College Avenues are two-way, whereas Elm Street and Highland Avenues are one-way within the square. Several smaller one-way streets also connect to the square.

The MBTA developed a central plaza linking the two station entrance buildings built on an old railroad right-of-way. This plaza replaced a poorly defined open area containing at-grade parking spaces and debris. The plaza is designed to serve as the center of Davis Square, a gathering place and center for activities and outdoor entertainment. The plaza and the station were both eligible for state percent-for-art moneys. One percent of the cost of constructing the new station entrances was used to commission several figurative sculptures, some of which represent local citizens, which are set within the plaza. In addition, tiles designed by neighborhood children were installed in the station and a large sculpture was commissioned to hang over the tracks. The public art projects fit in with the city's goal of creating a community place—a place where residents can feel a sense of ownership.

The old Boston and Maine Railroad right-of-way has become a bike path and greenway and, for part of its length, a designated bus way leading to the subway station. The bus way functions as a passenger stop for the College Avenue station entrance building, also called the head house, and there are other designated bus stops along Holland Street. MBTA buses and Tufts University's van services connect travelers to the subway line at these points.

Most of the remaining railroad right-of-way between Davis Square and the Alewife MBTA station in Cambridge (the Red Line's northern terminus) was redeveloped and landscaped as a linear park or bicycle/pedestrian pathway. A public park was constructed directly behind the Holland Street MBTA head house as part of a later project. The linear park connects at Alewife MBTA station with the Minuteman Trail, a 13-mile bicycle path traversing the towns of Arlington, Lexington, and Bedford. On the east side of Davis Square, an additional portion of the old right-of-way was redeveloped as a bike path. Known as the Grove-Cedar Streets segment, this facility was constructed in 1994 and is being upgraded with new lighting and grading with portions being used as a community garden.

Impacts and Assessment

The MBTA station and associated improvements have significantly transformed Davis Square, efficiently balancing a significant amount of vehicular traffic with an active

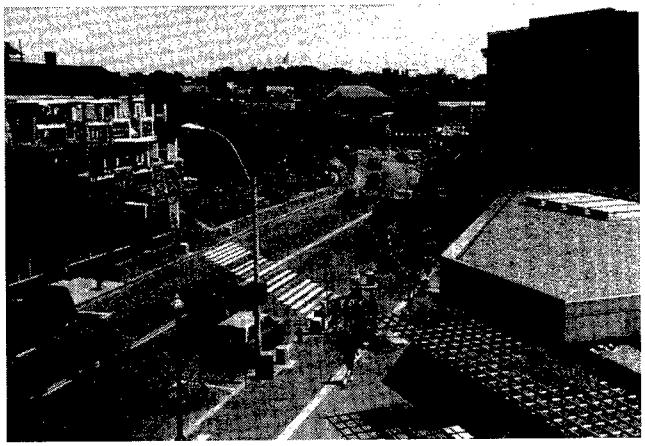


Figure 3-20. In Davis Square, ample paved pedestrian crosswalks and refuges are provided to make navigating between the Red Line T (subway) station, bus stops, and this seven-point intersection easier.

pedestrian environment. The streetscape improvements surrounding Davis Square station enhance pedestrian access to the station and local businesses while slowing traffic. These improvements also give the commercial area a more coherent appearance.

Transit Impacts

Undoubtedly the transit improvements have contributed significantly to the square's overall health, and the square's physical environment enhances public access and desire to use transit. Locating the subway station in Davis Square significantly decreased travel time into Boston for Somerville residents, making the area an attractive residential alternative for Boston-bound commuters. The presence of mass transit also makes the square's commercial district more attractive for office development, which contributes to the area's daytime activity.

The careful planning of Davis Square and its transit station has made it possible for people to reach the square without bringing more cars into this densely settled area. In fact, a before-and-after study completed in 1987 found that most subway riders boarding at Davis Square walk to the station (66 percent) and many others take a bus (21 percent). The station entrance buildings serve as bus shelters for passengers transferring between buses and between bus and subway. This multimodal function is particularly well planned at the College Avenue head house, where use of the former right-of-way as a bus way gives priority to buses, reducing the overall traffic moving through the intersection as well as bus travel times (Figure 3-21).

Traffic Impacts

The TOPICS changes made in the late 1970s were clearly designed to move automobile and truck traffic rapidly through the square. The result ignored the needs of pedestrians and would probably have led to further deterioration of the square had not the construction of the subway extension played a major role in reversing that trend. Now, the wider sidewalks, neckdowns, on-street parking, and irregular street configuration help to slow the traffic entering the square. At the same time, the pedestrian islands, medians, and center island serve to channel and calm the movement of cars within the intersection.

The street flow patterns do offer motorists numerous alternatives and turning options: two concurrent rotary (roundabout) patterns are formed by the one-way traffic on Highland Avenue and Elm Street in conjunction with two other adjoining streets. This gives motorists looking for on-street parking the option of recirculating through the square.

A traffic and circulation study conducted by the city in 1981 showed traffic volumes through the Davis Square area to be over 79,000 cars in a 24-hour period. Although recent traffic counts are not available, traffic has undoubtedly increased since that time as the popularity of Davis Square as a destination has grown. Traffic generally moves smoothly but slowly, and during evening rush hour all cars make it through the intersection in two cycles, if not one. The slower movement of traffic has made the square safer and easier for pedestrians to cross, although it has encouraged their inclination to jaywalk.

Although local businesses pushed for an increase in parking, residents thought more parking would lead to disintegration of the neighborhood's urban fabric. "Park and ride" facilities were completely ruled out and even "kiss and ride" dropoffs were discouraged. As a result, no facilities for commuter parking are provided in the square.

Pedestrian Impacts

The new brick and granite paving, upgraded lighting, and facade improvements have given the plaza and surrounding streets a fresh, well-maintained appearance, in marked contrast to the square's previous unkempt and deteriorated state. The plaza is principally used as a central square by residents who sit, watch, rest from shopping or exercise, or wait for the next bus. The plaza also functions as a resting place for cyclists who use the adjacent bike paths and as a meeting place or "front yard" for adjacent businesses. Annual community events such as ArtBeat, sponsored by the city and the Somerville Arts Council, are staged there. Periodically, the plaza is used for public speaking events as well.

Because of the density of Somerville and the proximity of residential neighborhoods to the Davis Square Station (as well as the carefully controlled parking supply), the number of people who walk to the station is high. The transformation of Davis Square from a pedestrian hazard to a pedestrian

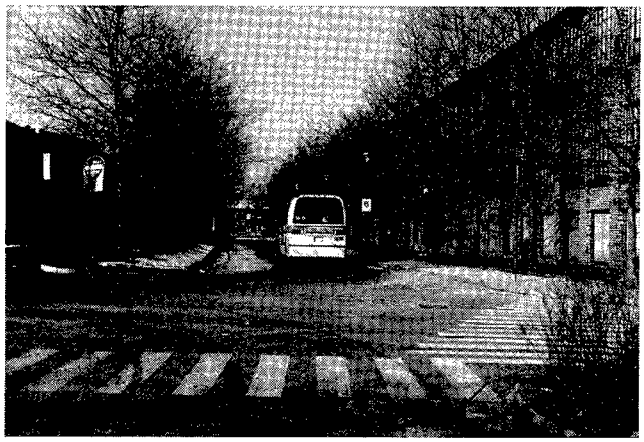


Figure 3-21. A dedicated bus way serves the College Avenue T station entrance.

attraction has offered an added incentive for walkers. By making crossings safer, by making the sidewalks more comfortable and better lighted, and by offering a diverse mix of retail activity along the streets, the square has become extremely friendly to pedestrians.

Efforts have recently been made to further improve pedestrian use of the square. Pedestrian crossing signal cycles, however, may need to be lengthened to reduce the amount and diversity of jaywalking that takes place. The pedestrian-only cycle, with a "chirping" walk signal, occurs about every 2½ min (slightly shorter when the pedestrian-activated light is pushed—then it cycles at 45 sec to 1 min). The pedestrian signal lasts a brief 8 sec followed by 12 sec of a flashing "don't walk." There are, however, pauses in traffic flow long enough for pedestrians to cross against the "don't walk" signal, which they do quite often. For example, the light on College Avenue is red for 40 sec, which gives pedestrians coming out of the College Avenue entrance time to cross; however, cars turning during the 45-sec, right-turn, green arrow from Highland onto College often conflict with these pedestrians.

Economic Impacts

When the new transit station opened in 1984, business around Davis Square did not immediately thrive. The number of retail stores in the area declined from 68 in 1977 to 56 in 1987. However, many nonretail uses, such as beauty salons and real estate offices, had already begun to fill the empty retail spaces. With the Boston area's emergence from its long recession, the area truly began to revive. The completion in 1993 of a new 100,000-ft^2 office and retail development on an urban renewal site adjacent to the Holland Avenue head house also may have helped spur investment. Many other smaller properties have subsequently been redeveloped. Clearly, the community's vision of a rebirth of commercial and retail activity has, in the past few years, been fully realized. All benefit from their proximity to the MBTA station, which has enabled the square's businesses to reach a wider patronage while serving local residents well. Retail vacancy rates around the square are close to zero.

Costs

The total cost of the Davis Square portion of the MBTA Red Line extension project was approximately $29 million. Urban Systems Program funding totaling $1.2 million was received from MASS DPW to fund streetscape improvements; $100,000 in CDBG moneys was received in 1982 to provide special paving, landscaping, and street furniture. HUD money was also used for streetscape materials; Congestion Mitigation Air Quality (CMAQ) money is being used to fund implementation of a new bus shuttle; and the Massachusetts Highway Department is paying for an expansion of the bike path. Somerset Bank funded a $1 million storefront rehabilitation program. In 1981, Davis Square won Commercial Area Revitalization District (CARD) designation, making it eligible for low-interest industrial revenue bond financing for business expansions and new construction.

Conclusions

The city and community leaders agree that the residents' intensive involvement throughout the planning process helped to set the direction and has led to the success of Davis Square. Many regional planners and even some city officials believed 20 years ago that the only way a new transit station could succeed was as a commuter "park and ride" facility. The city and residents have proven that they were right in fighting to preserve the residential character of their community and to create a setting for transit based on a comfortable balance between pedestrians and vehicles—instead of an automobile-dominated "park and ride" serving commuters from distant suburbs.

Next Steps

Today, 13 years after the opening of the Davis Square Red Line station in 1984, the city is continuing to implement the vision set out in the mid-1970s with continued pedestrian and transit-related enhancements: refurbishing of the central plaza and introduction of a new shuttle bus system that will provide even better access to the station.

In addition, the Massachusetts Highway Department will be conducting a bike path enhancement project, which will revisit the existing bike path spaces, replace fences along the bike path with friendlier gates, and add street lighting to facilitate nighttime riding.

The city is also working to redevelop some of the other squares in the city, most notably Union Square where, among other initiatives, they are exploring the feasibility of locating a commuter rail stop. With moneys from CMAQ and a matching grant from the city, Somerville also has plans to develop a cross-town shuttle to link each of the city's numerous squares to each other, to key commercial areas, and to the Red Line, thereby enhancing north-south transit service and eliminating half the bus transfers in the city.

Lessons Learned

- There needs to be an overall shared vision and consensus about what ought to be done. In Somerville, this

vision was developed nearly 25 years ago and is being faithfully and incrementally implemented through careful planning.
- Incremental changes were considered positive measures because they allowed for evaluation and corrections of what had been accomplished.
- Taking the steps necessary to create a walkable neighborhood will encourage people to walk to a transit station.
- An intersection that is hostile to pedestrians and friendly to vehicles can be reconfigured so that it is friendly to both.

CHAPTER 4

METHODS AND STRATEGIES TO CREATE TRANSIT-FRIENDLY STREETS

As the case studies in Chapter 3 demonstrate, communities are working together to integrate transit more effectively into their neighborhood and downtown streets. This chapter explores the broader impacts of this approach and provides an overview of the tools and strategies—as well as planning methodologies—that can be used to replicate the successful aspects of these projects in other cities.

PLACE-MAKING APPROACH TO LIVABILITY

In Phase I of the TCRP H-4D project research program ("The Role of Transit in Creating Livable Metropolitan Communities"), PPS focused on the important role of transit in fostering community livability and the specific ways that transit can act as a catalyst for community improvement. Opportunities for transit to work in partnership with communities to leverage additional funds to augment limited transit dollars also were investigated. Livability concerns of communities—such as generating economic opportunities, revitalizing downtown areas and other neighborhoods, improving safety and image, and making communities more accessible and convenient—were correlated with transit services and facilities in cities across the United States.

As presented in detail in the Phase I report, discussions about livability are often too broad or attempt to cover too large a geographic area to lead to development of practical strategies that can address local community concerns. Like the Phase I handbook, this Phase II study adopts a **place-making** approach to livability, an approach that involves assessing the concerns and needs of a local community and then basing improvements to the places within that community on this assessment. Because this approach focuses on "places," it can be applied to any community, regardless of socioeconomic status, demographic makeup, or even geographic location.

What Is Place Making?

Making communities livable through a place-making approach connects the concept of livability to the specific places used by people in communities. It begins at a scale that a community finds both manageable and relevant: the case studies in this report, which present streets in a downtown or neighborhood, are examples of a small area approach. When "closer to home" problems are defined, residents of an area are not only better able to identify priorities but are also more likely to become involved in a place's improvement.

Although place making does include design strategies, design is only a part of it. Many places have been improved through provision of better municipal services without implementation of any physical changes. Improving the maintenance and management of a public space, upgrading security, or establishing a special events or vending program are all strategies for improving a place without making design changes. The development of special management districts to oversee such activities, funded by special assessments agreed to by property owners, has flourished across the country, in both large cities and small towns, as more local organizations have begun to take responsibility for ensuring that their commercial districts are safe, attractive, clean, active, and comfortable.

Using "Place Performance Evaluation" for Transit-Friendly Streets

> *It is clear that the success of public acceptance to any radical change to the transportation network of an area depends on involvement and consensus [which] can only be gained through extensive public involvement and input. All aspects of transportation impacts need to be evaluated equally. . . . All parties: engineers; planners; residents; businesses; and elected officials; must objectively evaluate alternatives and not just look out for their own special interests. It is important to come to mutually agreeable solutions, through a fair and open process, which benefit the majority rather than simply satisfy the demands of a vocal few.*
>
> —*R. F. Dorroh III and R. A. Kochevar (14)*

In a busy commercial district, the "place" that is most critical to its economic and social success—and its impact on livability—is the street itself. The case studies presented in Chapter 3 demonstrate how, for this transit-friendly approach to designing streets, tradeoffs are essential. In both the Rochester and San Francisco case studies, pedestrian, transit, and vehicle needs were assessed and compromises were made during the planning process. Although certain tradeoffs were more successful than others, this approach generally

works in developing a street that benefits and serves diverse transportation needs.

Before trying to make a tradeoff—modifying a road, narrowing or reducing the number of lanes, introducing bus nubs, creating transit-only lanes, or changing traffic signalization—it is important to have done the homework. Analyzing what is actually happening on a street, what works and does not work, is clearly the first step to making real improvements. This information—not just traffic data—should be quantified as much as possible.

In Chapter 11 of "The Role of Transit in Creating Livable Metropolitan Communities," the concept of place performance evaluation (PPE) is presented. PPE is a series of tools that professionals and community members can use to measure the overall performance of an existing place with specific "livability" criteria. (In each of the case studies presented in this handbook, these same PPE methods were used to evaluate the impact of the improvements constructed.)

Readers interested in these methods should refer to Appendix E and to Chapter 11 of the above-mentioned handbook.

IMPLEMENTING TRANSIT-FRIENDLY STREETS: A BALANCING ACT

Because every street has its own unique problems and context, there is no simple formula for creating a transit-friendly street. Indeed, transit strategies implemented without regard to balancing other street activities and functions can be detrimental to the economic health and overall vitality of the street. Successful transit-friendly streets address **all** the functions of a street.

Transit-friendly streets also encompass strategies that link transit rail stations (subway and commuter) and bus transfer centers or terminals to downtown districts where pedestrian improvements have been implemented. For example, downtown Ann Arbor's transit service is oriented around a central bus transfer center with few stops downtown. While sidewalks on adjacent streets have been widened to create a strong pedestrian environment and buses use downtown streets to reach the terminal, this transit-friendly streets strategy provides a very different model from one that seeks to integrate all the functions on a street itself.

In general, transit-friendly street projects involve the careful and balanced allotment of street space to meet pedestrian needs—encouraging a lively, active public space while maintaining appropriate space for transit service, deliveries, parking, bicycles, and other vehicular movement. Adding or relocating crosswalks, providing traffic signals, widening sidewalks, and adding streetscape amenities are some of the design improvements typically used in these projects. In Rochester, for instance, transit shelters with seating, leaning rails, information, and heating are located along Main Street on sidewalks widened to provide adequate waiting and circulation space.

Of course, each case study community faced different problems and their solutions, therefore, are not identical. But cumulatively they offer useful lessons for transit agencies, cities, and community development organizations setting out to change the way their downtowns and neighborhood commercial streets function for people. What follows is an encapsulation of these concerns and the strategies used to address them.

1. *A balanced street is one that works for **all** users. Achieving the right balance among transit and other uses is a delicate matter, as it is easy for buses, in particular, to overwhelm these other activities.* Because every street is unique, formulaic solutions should be regarded with skepticism. Transit agencies, in particular, need to be careful not to rely on transit-only solutions. The effort expended on Chicago's State Street to make it a transit mall in the early 1980s failed to acknowledge the other uses on the street, and additional millions had to be spent to correct it.

In considering the balance between transit and a street, the type of transit vehicle used often has a significant impact on how a street looks and functions, as well as on ridership. In San Francisco, the historic streetcars have, in only a year or so of operation, become beloved community institutions and ridership has doubled compared with when the same route was previously served by a trolley bus. Light-rail vehicles may appear to be less obtrusive because they are quieter and emit fewer exhaust fumes than buses, as are transit vehicles that use alternative fuels (compressed natural gas, fuel cell, electric).

2. *Working to achieve the right balance is not a one-time effort but an ongoing process. This incremental process allows for evolution, correction, and adaptation of design over time. Sometimes, however, when a major project is completed, people working together think that their job is done.* The redesign of Davis Square in Somerville evolved through implementation of multiple small projects and with the help of multiple constituencies over a 30-year period in a step-by-step approach geared toward reducing automobile impacts while making improvements to the area. Through traffic-calming measures, streetscape improvements, and with transit playing a key and catalytic role, an entire commercial district has been revitalized.

In other case study cities, the people responsible for the original project never reconvened to discuss the effects of the project and the next steps (many had left their positions as well). During discussion groups conducted for this study, however, concrete ideas about next steps emerged. For example, in Rochester, tradeoffs were made during the planning process with traffic engineers about how far to take the project design (using projected numbers and assumptions). Main Street generally works well, but problem areas still exist. What is now under way is a reevaluation of the project using real numbers and real behavior to see what more can be done.

3. *It is not always necessary to undertake major construction to achieve significant results. In fact, small projects can have a*

large impact. One reason why smaller projects like those completed under the TPS program in San Francisco have such potential is that they proceed incrementally so that results can be evaluated as they are completed and modifications can be made. Projects, such as Portland's bus nubs, also can be done quickly and cause fewer negative construction impacts on businesses (primarily because the project is small scale) and still have positive, immediate benefits to transit and pedestrians.

4. *When redesigning a street, attempt to "design-in" the desired results (such as speed limits): don't rely on enforcement alone to achieve the results, because enforcement may be difficult to sustain.* Traffic calming can be achieved through enforcement or posted speed limits, but these measures are more effective when they are built-in to the street. Europeans have discovered that they can design a street to meet almost any speed limit and often do not even have to post a sign. Main Street in Ann Arbor and Davis Square in Somerville are successful because the design features—narrow vehicle lanes, neckdowns, paved crosswalks, and so on—help to physically constrain vehicle speed, thereby encouraging pedestrian usage.

5. *Pool local resources and energies: street design and management projects require a partnership between transit agencies, traffic departments, city planners, businesses, community development organizations, and citizens.* In the final analysis, this is perhaps the most fundamental lesson. While projects like Rochester and Davis Square enjoyed significant community participation and represented a diversity of constituents, others were not so successful. In Ann Arbor, the transit agency has been operating mostly on its own, fortunately with goals complementary to those of the DDA. Had the transit agency in Ann Arbor been a player from the beginning, connections between the new transit center and the revitalized Main Street probably would have been even better.

Such partnerships are important not just as part of a one-time planning initiative but as key forces and entities guiding and taking responsibility for the ongoing revitalization of a downtown or commercial district. As with the lessons of the Phase I study, the role of transit in creating livable communities is enhanced when transit agencies leverage the resources of other government and private resources, working closely with communities to address their goals and priorities.

The next section describes the methods that can be used to analyze the existing functions of a street as a basis for making informed decisions about future changes.

DESIGN AND TRAFFIC MANAGEMENT STRATEGIES FOR TRANSIT-FRIENDLY STREETS

The case studies in Chapter 3 show how different communities have developed and implemented projects and how they have actually worked. They reveal the care with which transit-friendly strategies must be applied to be successful and broadly affect community livability. In this section, we present general strategies that can be used to create transit-friendly streets, derived both from case studies as well as from general research, which focus on street design and traffic management strategies from the point of view of balancing the needs of people in transit, automobiles, bicycles, and on foot. Of course, not all the strategies apply to every situation, which is why the PPE methods for evaluating the functioning of a street become so important; clearly, understanding the nature of the problems on a street is the first step toward developing effective solutions to those problems.

Strategy 1: Provide Adequately Sized Sidewalks

The principal issue that must be addressed in the design of any commercial street is how to allocate its space—how much to give pedestrians and how much to give vehicles. The issue is further complicated by the diverse types of vehicles on most commercial streets: transit vehicles, private cars, delivery trucks, bicycles. To create livable, walkable communities, pedestrian space should not simply consist of what is left over after all vehicle uses are maximized. Rather, developing a strong pedestrian orientation for a street can help encourage decision-making about transit and vehicle usage, which can benefit the long-term livability of a neighborhood. Indeed, it should be emphasized that every transit rider is a pedestrian at some point during their trip!

Sidewalk Widening

City sidewalks are not just thoroughfares for pedestrians; they function as social places where people gather to talk or to meet friends and to watch other people. Although a sidewalk may be wide enough to accommodate pedestrian movement, it may not be wide enough to simultaneously accommodate seating, trees, bus shelters, and other appropriate amenities that support social activities. If a sidewalk is not wide enough for both walking space and amenities, it should be expanded or modified to provide those amenities (Figure 4-1).

Determining how wide pedestrian walking space should be is more complex than it initially appears. Sidewalks are divided into imaginary lanes: the area adjacent to store windows is a lane about 2 to 3 ft wide, which is a "viewing space" for window shoppers; at the curb, people generally create a 1½-ft boundary between themselves and trees, signposts, traffic signs, etc., thus creating a second lane; in between is the "walking space." There is a minimum desirable width for this walking space: 8 ft, or the amount of

Figure 4-1. A widened sidewalk in Rochester, New York.

space needed for two pairs of pedestrians to pass each other comfortably. There is no such rule of thumb for the *maximum* width of a walking space, but having too *much* space is just as undesirable as having too little. Too much space makes a sidewalk seem "empty," because people are distributed over too large an area. This occurs in many pedestrian malls, particularly during times of day when the number of users is low.

To balance the needs of pedestrians with those of vehicles on a street, it is necessary to understand how vehicles, whether they be transit or other types, use a street for through movement, passenger pickup and discharge, parking, and deliveries. Eliminating on-street parking, rerouting or restricting traffic to certain hours or certain lanes, calming traffic speeds to encourage through traffic to go elsewhere, and giving priority access to buses are examples of ways that street space can also be made available for pedestrian use. Ultimately, the kinds of changes that can be made to a street are limited by the width of the street and by other physical constraints, including local laws and jurisdictional ordinances.

Sidewalk "Nubs" or "Neckdowns"

Reconfiguring a street to accommodate pedestrian, vehicular, and transit uses need not involve extensive and expensive changes. Even if an entire street cannot be modified, it still is possible to make improvements by widening sidewalks at only the most congested locations or at intersections. Depending on the region, these extended sidewalks are called neckdowns, nubs, bulb-outs, bus bulbs, bump-outs, and curb extensions. We refer to them generally in this report as "nubs" but use the local term in the case studies.

Bus nubs are sidewalk extensions that include a bus stop (Figure 4-2). With a nub, sidewalks are extended through the parking lane until they are adjacent to the travel lane, which enables buses to stop in the travel lane to drop off and pick up passengers. Because the bus stops in the travel lane, it does not have to weave in and out of traffic at bus stops, which reduces conflicts between automobiles and buses. This speeds passenger boarding of buses, reduces dwell times, and helps to make transit service more efficient. Nubs also provide additional space for patron amenities, make boarding and alighting more comfortable, and can reduce pedestrian crossing distances. Unlike transit priority lanes, bus nubs do not require special traffic enforcement.

Bus nubs are the opposite of lay-bys (also called bus bays). In Germany, research on a ring road in Nuremberg showed that the average delay of a bus that had to pull in and out of a lay-by was 10 to 20 sec per lay-by, which doubled the average loading time of 20 sec. Because nubs improve the comfort of waiting passengers and reduce the use of lay-bys for illegal parking, they are becoming increasingly popular. Also, nubs cost one-third less to construct than lay-bys ($20,000 for a lay-by and $3000 to $5000 for a nub). However, bus nub installations can be expensive if, for example, street drainage systems also need to be reconfigured. In Portland, bus nubs average about $25,000 each. In France, a new product involving a steel-fabricated bus nub with a built-in shelter has been developed. It is simply installed over an existing street, allowing street water runoff to filter underneath. This system can be used to test a bus nub before a permanent installation is made.

Based on their study of nubs in San Francisco, the Texas Transportation Institute reported that nubs also benefit pedestrians and bus riders because they

- Reduce pedestrian and bus patron conflicts, especially where narrow sidewalks the cause;
- Increase the level of amenity that can be included at a stop; and
- Reduce the use of store ledges and awnings by waiting passengers because they increase the waiting area (*15*).

Figure 4-2. A bus nub in Portland, Oregon.

The ADA requires specific sizes and dimensions for boarding areas at bus stops. Curb extensions help create large enough bus stop and landing areas to accommodate wheelchairs and other passenger-related amenities, as well as retail, displays, and outdoor cafes.

Strategy 2: Provide Amenities for Pedestrians and Transit Riders

The enhancement of transit-friendly streets does not end at the curb but rather, should also include the design of the sidewalk space. All too often, transit stops lack amenities for riders, in some cases because of insufficient space but in other cases because of lack of resources. Two concurrent TCRP studies—"The Role of Amenities and Vehicle Characteristics in Increasing Ridership" and *TCRP Report 19*, "Guidelines for the Location and Design of Bus Stops"—explore opportunities for amenities to affect passenger experience and transit choice and give many practical suggestions for their implementation.

From a transit perspective, there are two ways to provide amenities. Most common are bus and light-rail stops spaced along a street. However, consolidation of bus stops into a transfer center allows for a concentration of passenger amenities in a single location, much like commuter rail or subway stations.

When transit amenities are located on sidewalks, they are usually part of a range of "street furniture," so named because they make a street more pleasant and comfortable to use. In addition to bus shelters (Figure 4-3), amenities can include seating (on benches or planter ledges), trees, telephones, light fixtures, trash receptacles, and information kiosks; clocks, fountains, sculpture, drinking fountains, banners, and flags are sometimes provided as well. The sale of food and other items can also help stimulate activity on the street, as part of store displays, either in movable pushcarts or in permanent stands. Therefore, food vending can be considered an amenity as well.

Although amenities can make a street more comfortable and active, their mere presence will not ensure that they will be well used. Careful attention to design and location is important. Bus shelters (without walls or with short canopies) often afford little protection from the sun, rain, and wind and provide few places for people to sit or lean while waiting. Seating may go unused if it is situated too far from areas of activity or if it is facing the wrong way. When amenities are located on a bus bulb but are poorly sited, blocking pathways to bus doors or obstructing views to approaching buses, the nub will not function efficiently for passengers or pedestrians. In addition, if not properly arranged, street furniture and transit shelter amenities can restrict access by wheelchairs (*16*).

Strategy 3: Create Priority Lanes for Transit Vehicles

A transit-priority (or transit-only) lane is one of most common strategies used to improve transit efficiency on a commercial street, either as part of larger projects (such as a transit mall) or separately (Figure 4-4). Although transit priority lanes seem like a straightforward strategy, they may not always work as intended.

Enforcement of priority lanes is difficult, as it is often impossible to keep private vehicles from using reserved bus lanes, especially when vehicles making right turns must occupy these lanes, sometimes for two blocks or more. On Main Street in Rochester, New York, the city created curb lanes for buses only (except for vehicles making right turns). In reality, however, the lane is frequently obstructed by cars picking up or dropping off passengers or by vehicles making deliveries (which are supposed to be made from side streets).

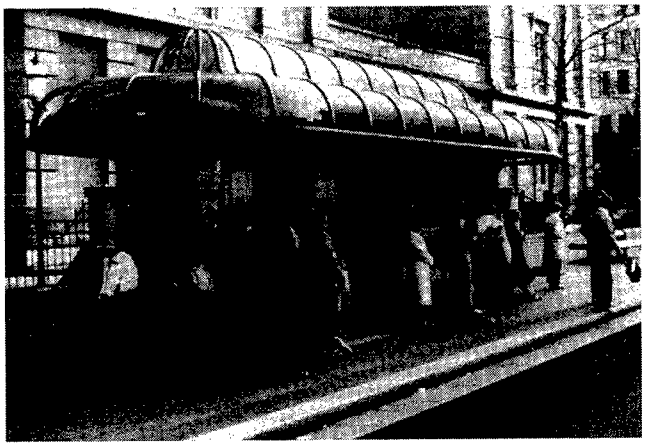


Figure 4-3. A bus shelter on the Portland Mall, Portland, Oregon.

Figure 4-4. Bus priority lanes on the Portland Mall, Portland, Oregon.

The bus lane is not well marked, and there are no diamond markings on the pavement. Such markings, including 8-in. solid lane markings between the transit lanes and regular traffic lanes, are essential for effective priority lanes.

In San Francisco, where there are over 10 mi of transit priority lanes, experience has shown that these lanes work most effectively when rigorously enforced. However, competing demands for traffic control officers make such enforcement difficult. On O'Farrell Street in downtown San Francisco, a different approach was tried: *left-sided* transit lanes were created, with a boarding island for bus patrons. The combined strategy of left-sided lanes and regular enforcement has succeeded in making the transit priority lanes work more effectively.

To address the problem of infringement of transit priority lanes in highly trafficked areas, cities may establish a "contraflow" system with buses in a single lane moving in one direction and cars in the remaining lanes traveling in the opposite direction. This is the case with a new transit priority lane under construction on Orange Avenue in downtown Orlando, Florida. One difficulty with this approach, however, is that it can cause safety problems for pedestrians who may not be expecting a vehicle coming from the opposite direction.

It is not unusual for bus lanes to be installed as a separate feature. However, the impact is usually limited to improving operational efficiency of the buses and not include the effect on the livability of a street. For example, in New York City, two lanes on Madison Avenue were converted to bus-only lanes during morning and evening rush hours. The level and intensity of bus usage, while operationally more efficient, create an unpleasant pedestrian environment, especially during rush hours. A similar situation occurs on Spring Street in downtown Los Angeles.

As with buses, surface trams and light rail must meet passenger needs with regard to safe access to transit stops while assuring efficient train operation. A TCRP study performed by Korve Engineering entitled "Integration of Light Rail Transit into City Streets" (*TCRP Report 17*), investigated safety problems experienced in light-rail projects. Design solutions suggested by that report seek to "respect the existing urban environment (unless a specific urban design change is desired)" and "comply with motorist, pedestrian and LRV (light rail vehicle) operator expectancy" (*17*). To reduce confusion for both pedestrians and motorists, the goal should be to not drastically alter an urban environment when light rail is introduced. Moreover, it is generally preferable to provide a dedicated right-of-way for LRVs by using pavement bars, rumble strips, cobblestone pavers, and mountable curbs instead of simply striping the pavement to separate light-rail operations from cars in the middle of a two-way street.

However, the degree of transit priority may vary depending on the situation. In Sacramento, California, light rail operates on different streets in different ways, depending on the type and function of the street. For example, in outlying residential areas, LRVs travel in their own right-of-way along a grassy corridor adjacent to major arterials. As they approach downtown, the right-of-way shifts to the street but is separate from automobiles. On the transit mall and in the central business district, however, light rail shares lanes with automobiles and buses.

Strategy 4. Initiate Traffic-Calming Measures for Automobiles

As noted in Chapter 2, traffic-calming measures that reduce the speed of vehicles are commonplace throughout Europe, and there is increasing interest in the United States. From a transit perspective, as has been noted in this report, traffic calming by itself can *reduce* transit efficiency and make it less convenient. As a result, a 1991 survey of bus operators in Great Britain showed that "Generally speaking, the measures that are most acceptable are those that cause no or little delay and allow a smooth and continuous movement of buses" (*18*). Preferred traffic-calming measures for streets with transit include methods that created "pinch points" instead of changes in street elevation (although raised crosswalks are acceptable), road narrowing by road markings, mini-roundabouts, bus berths or nubs, and changed road surfaces with materials such as pavers. (It is important to structure pavers for the weight of a bus.)

Many traffic-calming strategies exist (see Fig. 4-5). Figure 4-6 shows a traffic-calmed street in Denmark. Deployment of specific strategies is determined by the number of vehicles per day and, most significantly, according to the most desirable travel speed for vehicles on a particular roadway. Staggerings, gates, and prewarnings are recommended for roadways with more than 3000 vehicles per day and with speeds greater than 35 mph, which are conditions found in many American cities and suburban areas. In a more densely settled downtown core, along local roads where vehicles travel

Figure 4-5. A traffic-calmed street in Denmark.

Main Type		Road Class		Desired Speed (km/h)			Annual Day Traffic (ADT)	
		Traffic Road	Local Road	≥60	50	≤40	>3000	≤3000
1	Pre-warnings	x	x	x	x	x	x	x
2	Gates	x	x	x	x	x	x	x
3	2-lane raised areas	x	x		x	x	x	x
4	2-lane humps	x	x		x	x	x	x
5	Staggerings	x	x	x	x	x	x	x
6	Staggerings with raised area	x	x		x	x	x	x
7	2-lane narrowings from road centre	x	x		x	x	x	x
8	2-lane narrowings from roadside	x	x		x	x	x	x
9	Narrowings to 1 lane	(x)	x			x		x
10	Narrowings to 1 lane with raised area	(x)	x			x		x
11	Narrowings to 1 lane with humps	(x)	x			x		x
12	Staggerings with narrowing to 1 lane	(x)	x			x		x
13	Staggerings with narrowing to 1 lane and raised area	(x)	x			x		x
14	Staggerings with narrowing to 1 lane and humps	(x)	x			x		x
(x): To be used only in special cases								

Figure 4-6. Application of the main types of traffic-calming techniques.

more slowly but that still serve over 3000 vehicles per day, additional measures such as raised areas and lane narrowings are also recommended.

Although bus nubs (described above) are increasingly being used in the United States, it should be noted that, by themselves, they are ineffective as a traffic-calming measure because they are usually spaced far apart. In fact, research in San Francisco showed that delays for motorists caused by nubs are small or nonexistent, because many buses fail to pull fully out of the traffic lane at a stop. In Portland, Oregon, however, traffic engineers emphasize that installing nubs at bus stops makes the street safer because cars are less likely to try to pull around and pass a bus that is only partially in a bus stop lay-by area.

Finally, another common strategy used in Europe, based on years of experience with traffic calming, is to completely segregate transit from a traffic-calmed area—as long as walking distances are less than 300 meters from the traffic calmed places, according to one study from England. "Re-routing buses from streets chosen for traffic calming on to other streets may be an option and is very often now chosen by bus operators themselves." However, official government policy is that "in shopping areas, access to buses should be at least as convenient as to car parks" (*19*).

Strategy 5: Redesign Intersections and Modify Signalization

Signalization changes and other design features at intersections can also have a positive impact on transit efficiency.

For mixed traffic and transit priority lanes alike, these strategies can help provide additional priority for transit vehicles. On Upper Market Street in San Francisco, it simply was not possible, for example, to create transit-exclusive lanes without creating untenable traffic congestion. The solution was to mix streetcars and automobiles but to time signals to minimize traffic delays caused by boarding and discharging of passengers. This strategy is working well, as traffic flows evenly and the streetcars cause no delays to other vehicles. However, as with other strategies, it is important to weigh other considerations at intersections, such as the effect of their design on pedestrian movement.

Intersection Design

The geometry of intersections and the timing of the traffic signals are often designed for the needs of vehicles rather than pedestrians. For example, traffic engineers often prefer wide curb radii that make it easier for vehicles to turn. However, the larger the radius, the more inconvenient and dangerous it is for pedestrians to cross the intersection, because there are cars turning in front of and behind them. Greater ease of turning leads to speedier vehicle movement and less time for pedestrians to establish right-of-way when crossing the street.

Narrowing the street width, by widening sidewalks along the full length of a street or just at intersections, can facilitate pedestrian crossing. Another advantage of bus nubs located at intersections is that they too create shorter pedestrian crossings and safe waiting places, often enhanced by amenities, while making it unnecessary to alter traffic lanes.

Traffic management strategies, such as signalization changes, restricted turning movements, and reduced traffic speeds, can clearly reinforce these design changes. As noted in AASHTO's *A Policy on Geometric Design of Highway and Streets*, "Traffic control devices on arterial streets are usually installed with the intent of favoring automobile traffic with only secondary consideration to transit vehicles .... Where local service is provided by buses, however, with frequent stops to pick up and discharge passengers, a signal system that provides for good progressive movement of privately operated vehicles may actually result in reverse progression for buses. The resulting slow travel speed for buses tends to discourage patronage, further adding to the already heavy volume of automobile traffic" (*20*).

Signal Preemption

Signal preemption is a system installed to hold a green light for transit vehicles or to change the light to green after a minimal period so that transit vehicles need not stop at an intersection. A variety of technologies can be used, ranging from contacts on light-rail overhead wires to systems using radiowaves or soundwaves.

In San Francisco, 16 intersections were outfitted with this technology in 1988. For trolley coaches and light-rail vehicles, preemption is triggered by contacts on overhead wires. An analysis of the impact showed a reduction in transit delay of 6 to 10 percent. However, newer systems have been less reliable technically and seem to require a high level of maintenance, including weekly inspection. Installation costs, averaging $30,000 per intersection, are not insignificant. The city is investigating other options to reduce initial and ongoing maintenance costs and to increase reliability.

A simpler system was used on Upper Market Street in San Francisco. Here, the regular signal is timed to the speed of the streetcar, which shares a travel lane with cars. As the streetcar approaches the stop, the light turns red, allowing passengers to get on or off the vehicle. By the time the light changes to green, passengers are seated and the streetcar can proceed, without further delays to motorists.

More recently, Pace, the suburban bus provider in Chicago, has been experimenting with a system in which buses with a special "transponder" (costing about $10,000 per bus) send a signal to coils buried in the pavement about 250 ft from an intersection. These coils trigger lights to stay green a little longer or to change from red a little faster. As a result, trips along an experimental corridor have been reduced by 2 to 3 min. Although the system has not yet been evaluated, Pace is generally pleased with the results to date and intends to consider adding technology that will affect the signal only when a bus is behind schedule.

Priority Green

With this signalization system, buses and trams are given a head start at intersections; that is, buses get a green light before automobiles do. Because transit vehicles get a jump on automobiles queuing at a red light, they merge more easily back into traffic. In Europe, where this system is common, priority green not only has been effective in speeding transit but also has had a negligible effect on private car traffic. In addition, journey times for trams and buses are now shorter and the speeding up of service (by about 5 km per hour, or 20 to 25 percent) often means that one less vehicle has to be deployed, which can save the transit operator money (*21*).

Transit priority signals can be activated by the vehicle or the transit driver. If the vehicle is traveling in a dedicated lane or right-of-way, a detector that triggers the traffic signal to change can be imbedded in the pavement. If the transit vehicle is moving in mixed traffic, the driver can trigger the traffic signal from the vehicle. According to the Ontario Ministry of Transportation, this method is most effective when it is used at intersections where transit vehicles face routine

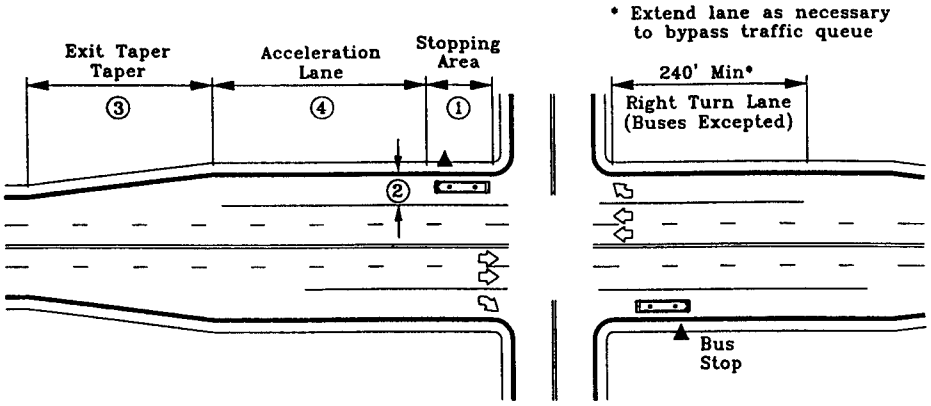


Figure 4-7. A queue jumper bus bay layout. (From TCRP Report 19, "Guidelines for the Location and Design of Bus Stop.")

delays because of heavy volumes of automobile traffic or where transit vehicles need to make left turns against steadily oncoming traffic (*22*).

Both the early green and queue-jump transit priority strategies (the latter is described below) were tested at four intersections in Portland in the early 1990s. In general, bus travel times decreased in the peak period in the peak direction. Also, vehicle delay did not change significantly, and the delay for bus passengers decreased 12.3 percent with bus priority (*23*).

Queue Jump

Another strategy to provide transit priority at intersections is to narrow streets at transit stops to prevent automobiles from passing buses and to reduce the danger to pedestrians crossing the street to the bus stop. This method, called "queue jump," is most easily accomplished by transforming a right-turn lane with simple signage (such as "right-turn only except buses") and then providing a small bay on the far side of the intersection for buses to reenter the flow of traffic (Figure 4-7). In Devon, England, for example, this is common practice and is very successful (*24*).

Many transit planners believe that this technique is most appropriate for use on roadways with heavy volumes of automobile traffic. The Phoenix and Orange County manuals cited by the Texas Transportation Institute (in *TCRP Report 19*, "Guidelines for the Location and Design of Bus Stops") recommend queue-jump lanes at arterial street intersections in the following situations:

- When there is high-frequency bus route travel at an average headway of 15 min or less;
- When traffic volumes exceed 500 vehicles per hour in the curb lane during a.m. or p.m. peak hours;
- When the intersection operates at a level of service of D or lower; and
- When cost and land acquisition are feasible.

The report also suggests that when right-turn volumes exceed 400 vehicles per hour, an exclusive near-side bus lane be added to the near-side right-turn lane as well (*25*).

FUTURE DIRECTIONS

The opportunities to create transit-friendly streets clearly will be enhanced by emerging technologies that will give greater control for all modes of vehicle traffic. Automatic vehicle locator systems, for example, increasingly are being used to monitor buses in service with satellite connections to a central dispatch. When buses are delayed, the dispatch unit receives information from a transmitter attached to the bus and additional buses can be deployed. Similarly, information received from the buses then can be relayed to passengers waiting at the bus stops. Using these technologies in combination with other design and traffic management strategies will facilitate the development of transit-friendly streets in the future.

CHAPTER 5

CONCLUSIONS AND FUTURE RESEARCH

More and more communities today are dissatisfied with the level of traffic they must endure. In fact, concerns about traffic volume, noise, and pedestrian safety may even exceed concerns about crime and other security issues in many communities. As communities seek design and management strategies to make streets more livable places, transit can and should play an important role.

In this report, we have taken a close look at five cities where transit has played a key role in improving the balance of a street for all users. We have also summarized strategies used in other cities in Europe and the United States. Although this report is not an exhaustive analysis of this complex issue, much has been learned that can be shared with other communities. Indeed, many transit and city officials working in the case study communities told us that they felt as if they were proceeding in uncharted waters and were anxious to let others know what they had learned about what to do—or what *not* to do.

At the same time, compared with the European experience, the case studies show that more needs to be done in the United States to achieve more effective results.

KEY CHALLENGES

Addressing Traffic Standards

Traffic design standards, and the way they are applied in communities, are a potential obstacle to implementing transit-friendly streets. The designs of some of the streets in the case study communities may have been compromised by standards applied by local engineers—which were often in conflict with stated public goals for the project. In his article "Restoring the Rule of Law and Respect for Communities in Transportation," Steve Burrington of the Conservation Law Foundation states that "transportation agencies have succeeded in elevating the limited logic of conventional traffic engineering to the status of public policy . . . engineers have assumed responsibility for defining public goals" (*26*).

However, standards are beginning to change, as are the ways they are interpreted and enforced. Engineers and planners in cities are beginning to take note of the work taking place in Europe, particularly in Denmark where the Danish Ministry of Transport Road Directorate states clearly that "communities neither can nor should be molded to the requirements of car traffic" (*27*).

Understanding the Potential of Transit to Improve Livability

Although there are many recent projects (as illustrated in Appendix A) in which transit plays a key role in reconfiguration of a street, these projects do not yet constitute a significant trend. Awareness is increasing, but most streets in most commercial districts have yet to be designed with a balance of uses in mind. As was explored in Phase I of this report, transit agencies and communities can benefit from partnerships in which they work together to achieve common goals. Transit must play a more important role in a community before it can take a more important role on the street, although the latter can help create an increased community visibility. Even transit-oriented cities need to remind themselves of the benefits and role of transit: the fact that State Street, in downtown Chicago, was converted from a transit mall into a regular city street has made a difference, but why eliminate the bus shelters for transit patrons entirely?

Developing and Sustaining a Shared Vision

Implementing transit-friendly streets requires a shared vision from the start as well as a sustained effort over time. This sustained effort is what makes the difference in the case studies in Portland, Oregon, and in Davis Square, Somerville, Massachusetts. This is most visible in the case of Somerville, where construction of the subway station was a catalyst in making the area more pedestrian oriented, in transforming Davis Square, and in realizing a 20-year-old vision developed by the community. Portland's bus nub program was 10 years in the making and grew from an earlier decision by the city administration to divert funds away from highways toward transit.

If balancing street space among all users is key to creating and sustaining livable communities, then the users must continue to play a role. In Rochester, although the business community and city together shaped the vision for improvements to Main Street, this partnership was not sustained at the same

level after the project was completed. Balanced, transit-friendly streets are, as we have stated, "places" in communities and have many of the same qualities as train stations, parks, and public libraries—all of which require ongoing management and community stewardship.

FUTURE RESEARCH AND DIRECTIONS

If traffic standards, understanding the potential of transit, and developing a common vision are challenges we face in the United States, then we must look beyond our borders for skills and tools that have been successfully used elsewhere. Because European transit and traffic professionals have been the true pioneers in creating transit-friendly streets, more information is needed, not just about what was achieved but about how it applies to the United States. Working directly with transportation planners in Europe—especially in Denmark, Germany, the United Kingdom, and the Netherlands—and doing evaluations similar to the case studies in this report would provide insight into how streets have been redesigned to meet the needs of a broad range of users.

Such an effort is only the starting point, however. Understanding these new opportunities will be helpful, but significant change will require altering the entire context and assumptions under which streets are planned, designed, and managed today. Nothing less than a nationwide effort can provide the broad-based education, advocacy, and discussion that is essential to changing both attitudes and methodologies for restructuring communities toward streets that are people- and transit-friendly. At the same time, such an effort would need to foster local partnerships that work, one street at a time, to produce transit services and streets that make a real difference to the livability of a community.

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APPENDIX A

CATALOG OF STREETS

CITY	PROJECT NAME	TRANSIT USAGE	SITE CONTEXT AND ADJACENT USES	VEHICULAR MIX & USAGE	LEVEL OF PEDESTRIAN USE	DESIGN CONFIGURATION
Atlanta, GA	University Center	Subway, peds, bus	Complex of 6 universities tied together by bus, pathways, and Marta subway	Cars, pedestrians, bus and subway	High during school year & Olympics	Pathways link Marta stations to University campuses & residential neighborhhoods; streetscape improvements; coordinating bus service with subway; Olympic events at University venues.
Austin, TX	Guadeloupe St. Lamar Boulevard	Bus "	Mixed use, commercial and University of Texas	Cars, pedestrians, bus	High	Curb extensions, bus priority signalization systems
Chicago, IL	State Street & Wabash Avenues	Bus	Retrofit transit mall in center city and main retail corridor	Buses and peds	Low	Transit mall is being retrofitted with buses, cars, peds, on-street parking, etc. to make it work better than w/ transit only.
Corpus Christi, TX	Six Points	Bus	Mixed use, neighborhood commercial shopping center	Cars, bus	Moderate	Planted medians, improved bus stop amenities
Denver, CO	16th St. Transitway	Light Rail Bus Shuttle bus	Transit mall in c.b.d.being extended to Union Station Shopping, retail corridor	Bus, light rail, peds No cars	High, particularly at lunch & rush hours	Free shuttle bus connects bus passengers to terminals at both ends of mall; light rail stops, Edges treated to increase walkin
Fort Collins, CO	University area	Light Rail Buses	University town with a bike/ pedestrian culture; bike progrm	Bus, light rail, bikes, peds, cars	High	Bikes on buses, light rail in center of street, ped improvmnts
Jersey City, NJ	Exchange Place	Path Trains Subway	Downtown	Subway, bus, peds	Moderate	Light rail planned for existing bus mall.
Long Beach, CA	Metro blue line	Light rail	Mixed use main street	Light rail, cars	Moderate	
Orlando, FL	"LYMMO" project Downtown Orlando	Bus Shuttle Bus	Revitalized downtown with entertainment focus.	Cars, pedestrians, shuttle buses	High	Under contruction: streetscape improvements; shuttle in own r.o.w. connects to major parking

CITY	PROJECT NAME	TRANSIT USAGE	SITE CONTEXT AND ADJACENT USES	VEHICULAR MIX & USAGE	LEVEL OF PEDESTRIAN USE	DESIGN CONFIGURATION
Newark, NJ	Broad Street	Bus	Active, some retail, downtown	Cars, buses	Moderate	Exclusive bus lanes
Philadelphia, PA	Walnut & Chestnut Streets	Transit mall w/ buses	City commercial corridor	Buses, cars, peds	Moderate	Bus prority signalization, passenger amenities (shelters) on sidewalks, cars too, speeds average optimum 29-32 mph
	13th Street	under constr.		Buses, cars, peds		Neckdowns, textured x-walks, lighting, street trees, wider side-walks, change in pavers to slow cars.
Phoenix, AZ		Bus	Bus stop installation combined with street reconstruction	Bus, car, peds	Moderate	Bus stops are updated and improved as part of streetscape projects; waiting pads defined by brick pavers, landscaping.
Portland, OR	Morrison & Yamhill	Bus Light Rail	Downtown, stores, offices	Bus, light rail, cars, Pedestrians	High	Curb extensions, widened side-walks, on-street parking, at grade light rail stations, amenity groups along street, enhanced retail, 1 lane of auto traffic.
	NW 23rd Avenue	Bus	Neighborhood commercial, mixed use and residential	Bus, pedestrians, cars	Moderate	Curb extensions at bus stops Passenger amenities
	1st Avenue	Light Rail	Portland Saturday Market Skidmore historic district. Cafes, Convention center	Cars, light rail, pedestrians	High	Two way light rail service, 1 lane of cars, sidewalks w/ light rail stops

CITY	PROJECT NAME	TRANSIT USAGE	SITE CONTEXT AND ADJACENT USES	VEHICULAR MIX & USAGE	LEVEL OF PEDESTRIAN USE	DESIGN CONFIGURATION
Portland, OR	Milwaukie Avenue	Bus	Neighborhood commercial in need of revitalization; plaza	Cars, buses, peds	Moderate	Curb extensions, narrow cross-walks, reduction of auto traffic
Providence RI	Kennedy Plaza	Bus	Major public square, facing City Hall, office buildings, former train station (relocated)	Limited car access Pedestrians, buses	Light to moderate; Transit users	Attractive, plaza-like setting with amenities
Sacramento, CA	Transit Mall	Light Rail	Downtown main street and cbd, to historic areas and outlying residential areas	Light rail, cars, pedestrians	Moderate at lunch-time	In the suburbs, light rail travels in dedicated r.o.w adjacent to the street; in city it has a dedi-cated r.o.w. in street; in city, light rail shares lanes with cars.
San Diego, CA	University Station	Light Rail	Downtown, University stop	Light rail, cars, peds	Moderate to high	Urban public space created by steps and design of station
San Francisco, CA	Polk Street (at Clay and at Sacramento)	Bus	Downtown street	Bus, pedestrian, car	High	Bus bulbs (bumouts) at bus stops
	Judah Street	Light rail	Inner Sunset district; neighbor-hood commercial street	No cars; light rail & pedestrian	High	Raised islands for boarding & alighting; cars returned and on-street parking is allowed.
	Outer Geary Blvd.	Diesel bus	Neighborhood commercial str.	Cars, bus, peds.	High	Planted median w/ angle parking
	Upper Market Street	Trolleys Subway Buses	Neighborhood commercial str.	Cars, bus, peds. Trolleys, Bart	High	Surface streetcar in shared traffic r.o.w., planted median w/ Canary Island palms.
	Liberty Hill	Streetcar	Delores Park with streetcar	Streetcar	Moderate	Street has palm tree median, Park overlooks center city, Streetcar travels though park in dedicated r.o.w., landscaped medians west of Church Street

CITY	PROJECT NAME	TRANSIT USAGE	SITE CONTEXT AND ADJACENT USES	VEHICULAR MIX & USAGE	LEVEL OF PEDESTRIAN USE	DESIGN CONFIGURATION
Berkeley, CA	Shattuck Avenue	Subway	Downtown, mixed use area near a university	Cars and buses	High	Wide boulevard with central 4-lane, 2-way roadway and side access roads with diagonal parking & pedestrian improvements
San Jose, CA		Light Rail	Area of successful redevelopment, downtown streets	Light rail, cars, ped	High	One way light rail on 2 way streets, continuous island platforms, bus stop & bus lane on side of island, upgraded retail
Seattle, WA	2nd Avenue	Bus	Downtown commercial street	Bus, cars, peds	High	Many traffic calming devices including traffic circles & removal of stop signs to slow cars
Somerville, MA	Davis Square	Subway, Bicycles, Bus	Central Square, retail center 2 bike paths, Red line T Stop	Cars, bikes, buses, Pedestrians University shuttles	High	Attractive square with cafes, landscaping, seating, public art, and streetscape improvements.

APPENDIX B

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APPENDIX C

LIST OF INTERVIEWEES

UNITED STATES

Dan Burden, Bicycle and Pedestrian Coordinator, F-DOT
Amy Coogan, American Public Transit Association
Tom Brahms, ITE
Don Miles, Zimmer Gunsul Frasca, Seattle; Chair, AIA Urban Design Committee
Elizabeth Drake, Pedestrian-Bicycle Planner, Phoenix, Arizona
Steve Burrington, Conservation Law Foundation
John Fegan, USDOT/FHWA, National Walking and Bicycling Study
Steve Dotterer, Chief Transportation Planner, Portland, Oregon
G. B. Arrington, TCRP panel
Jerome Lutin, TCRP panel
Samileh Mozafari, Traffic Engineer, Austin, Texas
Richard Beaubien, former City Traffic Engineer, Troy, Michigan; former President, ITE
Marshall Elizer, author of ITE's "Residential Street Traffic Control Guide"
Linda J. Meadows, System Safety Manager, LACMTA, Los Angeles, California
Ed Rowe, former Transportation Director, Los Angeles, California
Tom Becher, Assistant Director of Transportation, Minneapolis, Minnesota
Walter Kulash, Traffic Engineer, Glatting Jackson, Orlando, Florida

EUROPE

Bo Gronlund, Architect, Royal Academy of Fine Arts, Copenhagen, Denmark
Paul Murrain, Brookes University, Oxford, England
Rolf Monheim, University of Bayreuth, Germany
Bjarne Winterberg, Traffic Engineer, Denmark

APPENDIX D

SURVEY RESULTS/SAMPLE FORMS

	23rd Ave Port-land			Main Street Roch-ester			Upper Market San Fran-cisco		
	Bus	Ped	Tran	Bus	Ped	Tran	Bus	Ped	Tran
Cars drive too fast on this street.									
Agree	47%	39%	59%	0%	37%	37%	42%	47%	49%
Neutral	32%	29%	25%	64%	32%	28%	26%	30%	24%
Disagree	21%	22%	13%	27%	22%	18%	26%	13%	17%
No Opinion	0%	6%	3%	9%	10%	17%	5%	10%	11%
This street is easy to cross.									
Agree	17%	26%	15%	73%	73%	53%	47%	30%	37%
Neutral	19%	25%	25%	27%	15%	24%	16%	17%	16%
Disagree	64%	46%	55%	0%	11%	19%	37%	45%	42%
No Opinion	0%	2%	5%	0%	1%	4%	0%	5%	5%
The design of the stops makes me more likely to use transit.									
		24%	38%	27%	21%	39%		73%	38%
Neutral		27%	41%	18%	27%	35%		12%	37%
Disagree		15%	13%	27%	29%	22%		7%	11%
No Opinion		33%	7%	27%	23%	9%		7%	14%
The design makes me more likely to recommend transit to a friend.									
Agree		29%	38%	27%	16%	37%			43%
Neutral		27%	47%	27%	33%	35%			35%
Disagree		10%	10%	18%	22%	19%			5%
No Opinion		30%	4%	27%	29%	9%			17%
This street is a pleasant place to walk.									
Agree		81%	77%		42%	38%	74%	67%	72%
Neutral		9%	19%		22%	30%	26%	12%	16%
Disagree		7%	3%		35%	30%	0%	7%	7%
No Opinion		3%	1%		1%	2%	0%	3%	5%

Note: Bus = Business Survey Results
Ped = Pedestrian Survey Results
Tran = Transit Survey Results

Business Surveys

	NW 23rd Ave Portland	Main Street Rochester	Upper Market San Francisco
How long have you had your business in this location?			
One year or less	6%	18%	11%
1-5 years	33%	27%	32%
6-10 years	39%	18%	5%
Over 10 years	22%	36%	53%
How would you rate this street as a place to do business?			
Excellent	54%	18%	42%
Good	43%	36%	53%
Fair	3%	36%	5%
Poor	0%	9%	0%
Approximately what percentage of your customers walk or take transit to your business?			
Less than 25%	50%	0%	5%
26% - 50%	37%	20%	21%
51% - 75%	11%	40%	32%
Over 75%	3%	40%	37%
Don't know	0%	0%	5%
To what extent does transit service contribute to your business?			
Very important	5%	46%	16%
Important	29%	27%	37%
Somewhat important	45%	18%	42%
Not at all important	21%	9%	5%
To what extent does transit contribute to the OVERALL AREA as a place to do business			
Very important	27%	27%	44%
Important	30%	55%	39%
Somewhat important	32%	9%	17%
Not at all important	11%	9%	0%

Pedestrian Surveys

	NW 23rd Ave Portland	Main Street Rochester	Upper Market San Francisco
Circle all of the things you are doing today.			
Working	23%	67%	23%
Shopping	43%	20%	53%
Doing quick errands	29%	30%	42%
Waiting for the bus	6%	13%	20%
Strolling or window shopping	33%	12%	27%
Eating (carry-out or in a restaurant)	43%	75%	48%
Meeting friends, socializing	29%	17%	23%
Just passing through	11%	5%	13%
Visiting a professional office	6%	13%	7%
Banking	9%	29%	25%
Other	15%	9%	22%
How did you get here today?			
Walk	29%	27%	48%
Car	64%	47%	17%
Bus	6%	22%	7%
Bicycle	0%	1%	5%
Streetcar		N/A	20%
Other	0%	2%	3%
Tell us about yourself.			
Sex			
Male	53%	56%	73%
Female	47%	44%	25%
Age			
14-17	5%	0%	2%
18-35	52%	55%	49%
36-50	28%	30%	42%
51-65	11%	14%	5%
Over 65	3%	1%	0%
Occupation			
Professional/Technical	26%	66%	24%
Manager or Administrator	15%	20%	8%
Sales	7%		10%
Clerical	7%		2%
Machine operator or laborer	1%		0%
Service worker	9%		15%
Artist/Craftsworker	9%		9%
Student	10%	7%	7%
Homemaker	2%	0%	0%
Currently unemployed	7%	4%	0%
Retired	6%	3%	3%
Other	0%	1%	22%

Rochester Comparative Surveys

	Main Street Rochester 1985	Main Street Rochester 1996
In terms of bus service downtown, how would you rate the following		
Frequency of bus service		
Excellent	13%	17%
Good	37%	46%
Fair	29%	27%
Poor	16%	7%
Don't know	9%	4%
Reliability of bus service-buses running on schedule		
Excellent	10%	15%
Good	35%	48%
Fair	25%	24%
Poor	21%	11%
Don't know	9%	3%
Bus drivers for helpfulness and courtesy		
Excellent	13%	28%
Good	33%	38%
Fair	30%	17%
Poor	16%	15%
Don't know	9%	2%
Closeness of bus stops to downtown destinations		
Excellent	21%	28%
Good	40%	50%
Fair	19%	16%
Poor	11%	4%
Don't know	9%	2%
Waiting conditions at downtown bus stops		
Excellent	8%	11%
Good	22%	37%
Fair	29%	43%
Poor	34%	10%
Don't know	7%	0%

Office Use Only: Location _____

NW 23rd AVENUE
PEDESTRIAN SURVEY

Project for Public Spaces is conducting a national research study about the role that transit and street design can play in creating liveable metropolitan communities. Your answers to the following questions will greatly assist our research efforts.

1. Circle all the things you are doing on NW 23rd Avenue today: (circle letter)

a. Working
b. Shopping
c. Doing quick errands
d. Waiting for the bus
e. Strolling or window shopping
f. Eating (carry-out or in a restaurant)
g. Meeting friends, socializing
h. Just passing through
i. Visiting a professional office
j. Banking
k. Other (please specify): _____

2. What is your <u>main</u> reason for being on NW 23rd Avenue today, using the above list? Give the letter: ____

3. How did you get to NW 23rd Avenue today?

a. Walk
b. Car
c. Bus
d. Bicycle
e. Other (specify): _____

4. Please indicate your response to the following statements:

	Agree	*Neutral*	*Disagree*	*No Opinion*
Cars drive too fast on NW 23rd Avenue.	1	2	3	4
Traffic jams occur during rush hour on NW 23rd.	1	2	3	4
It is easy to cross NW 23rd Avenue.	1	2	3	4
The design of bus stops on NW 23rd Avenue makes me more likely to ride the bus.	1	2	3	4
The design of bus stops on NW 23rd Avenue makes me more likely to recommend riding transit to a friend.	1	2	3	4
NW 23rd Avenue is a pleasant place to walk.	1	2	3	4

5. How could NW 23rd Avenue be improved?

_____
_____
_____

6. Finally, tell us a little about yourself:

Your sex: Male Female

Your age: 14-17 18-35 36-50 51-65 Over 65

Your occupation:
1. Professional/Technical
2. Manager or Administrator
3. Sales
4. Clerical
5. Machine operator or laborer
6. Service worker
7. Artist/Craftsworker
8. Student
9. Homemaker
11. Currently unemployed
11. Retired
12. Other (specify): _____

Where you live: (zip code) _____

Thank you for taking the time to give us your comments!

Name/Location of Stop _____ Route Number _____

NW 23RD AVENUE TRANSIT SURVEY

Project for Public Spaces is conducting a national research study about the design of transit stops, waiting areas and vehicles. Your answers to the following questions will greatly assist our research efforts.

1. About how many times a week do you use this bus stop? (please circle one)

1. Five or more times a week
2. 3-4 times a week
3. Once or twice a week
4. Less than once a week
4. Rarely or never

2. Where are you coming from? (please circle one)

1. From home
2. From work
3. From school
4. From shopping
5. Other (specify) _____

3. Where are you going? (please circle one)

1. To home
2. To work
3. To school
4. To shopping
5. Other (specify) _____

4. About how long do you usually have to wait for the bus at this stop? (please circle one)

1. Less than 5 minutes
2. 5-10 minutes
3. 11-20 minutes
4. 21-30 minutes
5. More than 30 minutes
6. Don't know

5. Have you changed how often you ride the bus over the past year? (please circle one)

1. Ride the bus *more* frequently
2. Ride the bus *less* frequently
3. Ride the bus about the same

If you have changed your frequency of riding the bus, why has this change occurred?

_____

(Survey continues on other side)

6. Did you have a car available for this trip today?

1. Yes
2. No

7. How would you rate this bus stop for the following:

	Good	*Fair*	*Poor*	*Don't Know*
Overall attractiveness	1	2	3	4
Overall comfort	1	2	3	4
Ability to get schedule and routing information	1	2	3	4
Width of sidewalks	1	2	3	4
Cleanliness	1	2	3	4
Amount of seating	1	2	3	4
Comfort of seating	1	2	3	4
Protection from weather	1	2	3	4
Adequacy of lighting	1	2	3	4
Safety during the day	1	2	3	4
Safety during the evening	1	2	3	4
Ease in walking to the stop	1	2	3	4
Ease in boarding the bus	1	2	3	4

8. Please indicate your response to the following statements:

	Agree	*Neutral*	*Disagree*	*No Opinion*
Cars drive too fast on NW 23rd Avenue.	1	2	3	4
Traffic jams occur during rush hour on NW 23rd.	1	2	3	4
It is easy to cross NW 23rd Avenue.	1	2	3	4
The design of bus stops on NW 23rd Avenue makes me more likely to ride the bus.	1	2	3	4
The design of bus stops on NW 23rd Avenue makes me more likely to recommend riding transit to a friend.	1	2	3	4
NW 23rd Avenue is a pleasant place to walk.	1	2	3	4

9. How can bus stops or NW 23rd Avenue be improved?

_____

_____

_____

10. Finally, please tell us a little about yourself:

Your sex: Male Female

Your age: 14-17 18-35 36-50 51-65 Over 65

Your occupation:

1. Professional or technical
2. Manager or Administrator
3. Sales/Clerical
4. Machine operator or laborer
5. Service worker
6. Artist/Craftsworker
7. Student
8. Homemaker
9. Currently unemployed
10. Retired
11. Other (specify): _____

Where you live: (zip code) _____

Thank you for taking the time to give us your comments!

Interviewer _____ Date _____

NW 23RD AVENUE BUSINESS SURVEY

Project for Public Spaces is conducting a national survey about the role that transit and street design can play in creating livable metropolitan communities. Your answers to the following questions will greatly assist our research efforts.

1. How long have you had your business in this location? (please circle one)

1. One year or less
2. 1-5 years
3. 6-10 years
4. Over 10 years

2. How would you rate NW 23rd Avenue as a place to do business? (circle one)

1. Excellent
2. Good
3. Fair
4. Poor

3. Approximately what percentage of your customers walk or take transit to your business?

1. Less than 25%
2. 26% - 50%
3. 51% - 75%
4. Over 75%

4. To what extent does transit service contribute to your business? (circle one)

1. Very important
2. Important
3. Somewhat important
4. Not at all important

Why?_____

_____

5. To what extent does transit service contribute to the OVERALL AREA as a place to do business? (please circle one)

1. Very important
2. Important
3. Somewhat important
4. Not at all important

Why? _____

_____

(Survey continues on other side)

6. Please indicate your responses to the following statements:

	Agree	Neutral	Disagree	No Opinion
Cars drive too fast on NW 23rd Avenue.	1	2	3	4
Traffic jams occur on NW 23rd during rush hour.	1	2	3	4
It is easy to cross NW 23rd Avenue.	1	2	3	4
Transit vehicles make too much noise on NW 23rd.	1	2	3	4
NW 23rd Avenue is a pleasant place to walk.	1	2	3	4

7. What features do you like best about NW 23rd Avenue?

_____
_____
_____

8. What do you like least about it?

_____
_____
_____

9. What improvements do you think are needed?

_____
_____
_____

10. Business Name _____

Type of Business _____

Your name _____

If you are returning this survey by mail, please send it to:

Project for Public Spaces, Inc.
153 Waverly Place
New York, NY 10014

Thank you!

APPENDIX E

PLANNING, DESIGN, AND MANAGEMENT STRATEGIES FOR LIVABLE PLACES

NOTE: This appendix contains material from *TCRP Report 22*, "The Role of Transit in Creating Livable Metropolitan Communities," Chapter 11.

As the case studies in this handbook demonstrate, there are many simple and practical planning, design, and management strategies used by communities to enhance their livability. This chapter presents a process for developing these strategies as well as examples of typical projects and programs that can be developed to address a specific need or problem, including:

- Ways to identify whether or not a place is successful, using on-site observations and visual clues;
- Different methods for measuring and systematically identifying these problems;
- A summary of model design, management, and transit-related approaches that can be tried; and
- References to relevant case studies from the handbook.

This checklist is not intended to be all-encompassing, but rather, to serve as a starting point for a community-based planning process. It can be used by professionals and lay people alike; professional planners may find it especially useful in developing more detailed plans and design proposals.

ABOUT PLACE PERFORMANCE EVALUATION (PPE)

People continually ask, "How can we avoid repeating past mistakes and build transit facilities that contribute rather than detract from the livability of our communities?" This section describes one method. PPE is a series of tools that professionals and community members can use to measure the overall performance of an existing place (e.g., a bus stop, a train station waiting room, the site of a future bus transfer center) using specific "livability" criteria.

Evaluation of the issues particular to a place can be undertaken by a variety of techniques. These include systematically observing and recording activities at relevant locations, conducting special interviews with community members to elicit ideas and opinions, distributing community surveys to gather input on a variety of issues, and, in some cases, taking time-lapse film and still photographs to illustrate issues of concern. When communities actually take part in collecting data, there often is a significant increase in the quality of information collected and the level of involvement in project implementation. Users of a place have a great deal of valuable personal experience and knowledge, even though they may never have observed or thought about how others use it.

Evaluation tools include systematic observations, surveys and interviews, focus groups, community workshops, and development of the vision.

Systematic Observations

Simple observation is the best way to learn about how a place is used, whether the "place" is a small neighborhood bus stop or a train station used by thousands of people each day. However, transit planners often focus on operational efficiency without examining how transit facilities are actually being used. The result is that issues of operational efficiency—for which there are generally much data—become the primary criteria used in transit planning instead of customer comfort and use.

Systematic observation techniques are simply tools that help focus casual observations and help document issues or problems that might be overlooked. These techniques also enable an observer to quantify what would otherwise be regarded as intuition or opinion, contributing to a better understanding of the full extent or severity of a particular problem. Observation techniques include behavior mapping, where an observer records the location and type of activities taking place as well as information about users at regular intervals throughout the day and over a period of time, and pedestrian counts of major routes and "tracking" routes or paths taken by users through a space. Time-lapse filming is a more sophisticated tool that can be used to collect this type of information, which also has the advantage of being an effective means of presenting results visually.

In general, observation techniques help to define, in more real terms, how transit can contribute to the livability of a community. For example, when judging the performance of a specific bus stop, or to make sure that it is situated in the proper and most convenient location for current and future riders, one would be able to answer questions such as

- How easy is it to get to and from the bus stop to the surrounding neighborhood?
- Are there places to sit in the shade if it is a hot climate; does it look inviting and attractive; are people waiting comfortably?

- Is the area "busy"—with activity either at or around the stop or in areas near the transit stop?
- Do people speak to each other or interact with each other?; do they seem to know each other or recognize friends?

Surveys and Interviews

In addition to observing how a place is being used, understanding people's perceptions is also important, particularly the perception of people who do *not* use a place. The main objective in measuring people's perceptions should be to find out what people like and dislike about a place and how they think it could be improved. Qualities such as cleanliness, safety, and availability of amenities such as food, newspapers, and rest rooms can be rated by transit users if they are asked about a specific place about which they are familiar. These questions should also be posed to area businesses and other adjacent uses as well as to people living and working in the immediate vicinity.

For nonusers of a place, the questions obviously must be different and should address why they do not use a place and what, if anything, could be done to encourage them to use it. A similar approach is used if a place does not yet exist, such as a new transit facility. Surveying nonusers is in many ways more complex than observing or surveying an existing place. However, with today's computer technology, it is not difficult to conduct mail or telephone surveys and to tabulate the results.

Finally, interviews should also be conducted with key individuals and representatives of organizations who could play a role in implementing a project or program. These interviews are especially important as the first step toward building effective, ongoing partnerships.

Focus Groups

In many situations, small focus group sessions or informal discussions with targeted audiences (such as seniors, students, merchants, or a combination of groups) can be especially useful in the early, exploratory stages of a project before detailed observations and surveys are undertaken. Through these open, informal discussions, which can be guided by the same questions that are used for a survey, people talk and share their ideas about existing projects and programs with others. This invariably leads to numerous creative ideas for improvements that people and organizations can cooperatively undertake.

Community Workshops

Large community meetings are also useful, when properly managed, not only to involve people, hear what they have to say, and resolve conflicts, but also to challenge people to raise their expectations. To elicit the full creativity of the community, to stretch perspectives, and to encourage bolder thinking, examples from other cities should be sought—like the video presentation that accompanies this handbook—to demonstrate possibilities that stir people's imaginations. This also stimulates thought and discussion about additional issues and potential solutions that can be put into action, which is usually most effectively accomplished in smaller focus groups. These groups can then report their findings back to the larger reassembled workshop, which helps to validate their recommendations to one another.

Developing the Vision

Qualitative and quantitative information about the use of places that is gained from observations, meetings, and surveys can then be combined with more traditionally collected information about demographics, transit ridership, market research information, etc. Together, all this information provides a picture of the broad range of issues that need to be addressed in planning a transit facility or service so that it contributes to the livability of the community that surrounds it. Some of the issues will directly impact transit, and others will not. An understanding and commitment to dealing with both provides an opportunity to develop important working relationships with community organizations, many of which may have never worked with a transit agency before. The end result of this process is a vision: ideas for the program; goals of the community and organizations or individual partners who should be kept informed and involved, very often through some kind of task force or working group; and the "tasks" to be accomplished.

LIVABLE PLACES: A CONCEPTUAL MODEL

Based on its own research as well as quality-of-life research, PPS has developed a simple graphic that describes a model for evaluating the attributes of livable places. These attributes reflect the common issues that people tend to identify when they talk about livability in their communities and include tangible, statistical aspects as well as the intangible qualities that people feel toward a place *or* a neighborhood. These attributes, which are presented in the "place diagram" in Figure E-1, fall into three categories:

- *Key attributes* of places are the components that, based on livability research, are essential ingredients of a place: uses and activities, comfort and image, access and linkages, and sociability. These general criteria arise again and again when people talk about the problems and needs of their communities.
- When people describe their communities, they use words like "safe," "fun," "charming," and "welcoming." These words describe the *intangible qualities* of communities that relate to specific types of attributes.

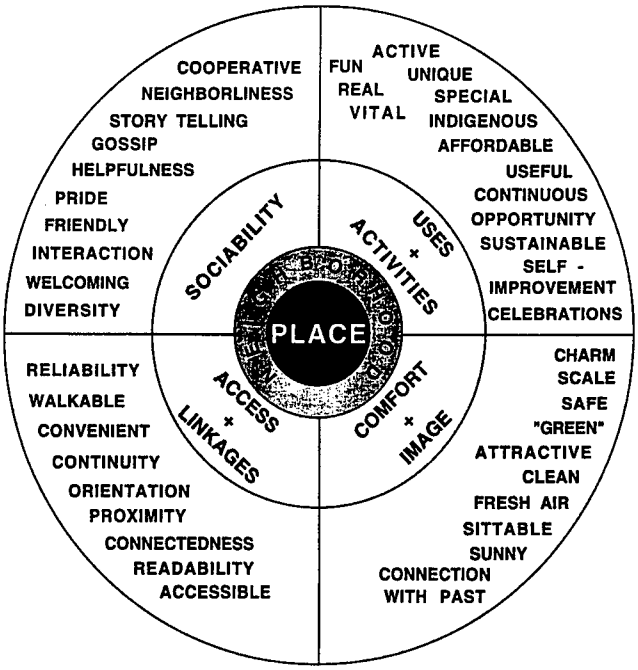

Figure E-1. Attributes of livable communities.

- It is possible to systematically measure both the intangible qualities and key attributes with existing statistics or by conducting research. These *measurements* help establish a quantitative base for evaluating the qualitative issues, although experience has shown that such measurements do have their limitations.

An important consideration in developing this model was *not* making value judgments about the relative importance of different attributes to different communities. Rather, it is up to each community to choose its own priorities. Different socioeconomic situations, living conditions, and political context make each community unique. A community is also in the position to determine the *scale* of improvement—that is, whether a project or program should be initiated at a "place" versus in a larger neighborhood context.

This model can be extended to include other issues. For example, one of the challenges in creating livable places is the general lack of communication between different city agencies, professions, and interest groups responsible for a place. This model helps to identify groups (e.g., chambers of commerce, block associations) associated with specific attributes that could be approached to participate in a project.

STRATEGIES FOR CREATING LIVABLE PLACES

Each of the following sections presents a different attribute from the "place" diagram.

Uses and Activities

"Uses and activities" are the basic building blocks of any place; they include all the reasons why people come to an area. The types of land uses or activities help determine what makes a place in a community special or unique. Uses and activities do not necessarily have to be inside a structure, however. Public spaces, too, can accommodate a wide variety of activities.

Very often, transit uses and functions operate separately from other community activities. For example, many bus transfer terminals located in isolated areas have no use other than providing access to other buses. In this situation, where there is little or no other activity taking place, it is less likely that transit is a factor in enhancing livability except by providing mobility. However, if the bus terminal were more centrally located, and there were a place where one also could buy a newspaper, get a snack, visit a farmers' market, or window shop, then the transit use would be contributing to the overall activity and livability of that area.

Visible Signs . . .

. . . of Success

- Many different types of activities are occurring.
- Many different kinds of people and different age groups are using a place (children, elderly, families, etc.).
- Activities are not necessarily related to a specific facility or a planned event.
- There are several "choices" of things to do and it is easy to go from one choice to another.

. . . of Problems

- Spaces are empty of people for all or part of the day.
- Security problems are evident (broken windows, graffiti, vandalism, etc.).
- Buildings are vacant or underutilized.
- Uses are isolated from each other or cannot be seen.
- Spaces are too small and congested for the number of transit riders present.

Ways of Measuring

- Record the number and type of activities at different times of day and week.
- Survey the community or space users about their perceptions of current uses and activities and what they would like to see there in the future.
- Inventory existing land use patterns to determine what activities are present or missing.

Approaches . . .

. . . to Design

- Create a public space that can be programmed for a wide variety of uses.
- Provide amenities that support desired activities.
- Provide specific uses and activities in adjacent or nearby structures.

. . . for Management

- Program community events and activities, such as markets and local festivals.
- Develop strategies to lease empty buildings to help revitalize an area.

. . . for Transit

- Make a transit stop the central feature of a place.
- Develop easy transfers between buses or modes of transportation.
- Provide amenities for transit patrons.
- Provide information about attractions in the area.
- Designate a liaison from a transit agency to coordinate with users in the area.
- Train on-site transit personnel (such as ticket agents or maintenance workers) to provide information about uses and activities in the areas adjacent to a facility.

Comfort and Image

"Comfort and image" reflect the subjective experiences of people as they use a place. Issues like safety and cleanliness are often uppermost in people's minds. Other issues are less consciously acknowledged, although people are absorbing tremendous amounts of "data" being projected by the environment: scale, character of buildings, sense of safety, and "charm." People *become* aware of other specific aspects, however, like the need for a bench when they want to sit down.

Transit patrons are concerned about comfort and image during their entire experience from the time they enter a station, board a vehicle, until they reach their final destination. For this reason, issues of security and cleanliness to a community also affect transit riders. How a transit agency manages its facilities affects a broader area. In the same way, transit facilities can increase comfort in an area; for example, benches used by bus riders can also be used by shoppers if they are in a location convenient for both. Or, an attractive, pleasantly scaled transit facility can contribute to the attractiveness of a whole area.

Visible Signs . . .

. . . of Success

- Spaces are clean and free of litter.
- Seating is located near other activities.
- Users have a choice of places to sit or use in the sun or shade; appropriate weather protection also is offered.
- "Undesirables" are not able to dominate use of a space.
- Someone seems to be in charge.

. . . of Problems

- Few places exist for people to sit.
- The environment generally appears unattractive or unsafe.
- Buildings or spaces lack human scale.
- Litter and other signs of lack of maintenance are evident.
- Poor environmental quality exists (air, water).
- No one is obviously in charge.
- There is a lack of weather protection.

Ways of Measuring

- Review actual crime statistics and complaints.
- Survey people's perception of an area (safety, attractiveness, cleanliness).
- Analyze actual use of amenities such as seating.

Approaches . . .

. . . to Design

- Upgrade the physical appearance of a place with improved materials.
- Add public amenities (seating, telephone, waste receptacles).
- Provide information (for transit facility and surrounding area).
- Create community-oriented public art.
- Restore or renovate existing buildings.
- Add trees and landscaping.

. . . to Management

- Provide special security programs, such as community policing.
- Increase security presence through uses and activities or by having someone in charge of the area.
- Upgrade maintenance, including both daily cleaning as well as preventative maintenance of physical facilities.

. . . for Transit

- Assure customer-friendly operations on and off transit vehicle.
- Initiate special security services for transit riders.
- Establish cooperative efforts with local communities and police.
- Reorganize organizational structure to create station and transit terminal managers.

Access and Linkages

Transportation "access and linkages" are ways to connect places in communities. A successful neighborhood allows access and linkages between places, that is, a variety of options for people to get from one place to another—walking, transit, bike, or car. Or, said another way, a successful place has a variety of ways by which people can get to it.

Access and linkages also refer to how well a specific place, like a transit facility, connects to the immediate area around it and the ability of people to circulate within that place and to reach different uses. There is a qualitative component to access as well. Access is affected by other factors, including physical elements (e.g., a continuous row of stores along a street is more interesting and generally safer to walk along than a blank wall or an empty lot) and perceptual elements (e.g., ability of people to see a transit stop from a distance).

Visible Signs . . .

. . . of Success

- People can easily walk to the place; they are not darting between moving cars to get to the bus stop.
- The interior of the place or transit stop is visible from the outside.
- Sidewalks lead to and from adjacent areas, allowing for convenient pedestrian access.
- Occupants of adjacent buildings use the place.
- Continuity of street level for uses makes for a pleasant walking environment.
- A variety of transportation options provide access (transit, car, and bicycle.)

. . . of Problems

- Traffic is congested or fast moving, acting as a barrier to pedestrians crossing the street.
- Bicycles are infrequently used as a mode of access.
- People are walking in the street or along areas not paved as sidewalks.
- Pedestrian-oriented uses (such as storefronts) are discontinuous, creating an unpleasant walking environment.
- There is insufficient parking.

Ways of Measuring

- Conduct observations, counts, and tracking of pedestrian circulation within and around a place.
- Record the location and finished treatment of sidewalks and number of curb cuts to determine suitability for walking.
- Map the area to determine which uses generate pedestrian activity.
- Survey pedestrians to determine attitudes and patterns.
- Survey the broader community to determine how and why different modes of transportation are used.
- Conduct parking turnover studies to determine efficiency of usage.
- Conduct traffic studies to determine level of use over the day and week, as well as occupancy of vehicles.

Approaches . . .

. . . to Design

- Widen sidewalks or provide sidewalk extensions at crosswalks, better balancing pedestrian uses with other uses of the street (vehicles, transit vehicles, bicycles, deliveries).
- Construct more clearly marked or more conveniently located crosswalks.
- Make accommodations for bicycle users (bike lanes, lockers, storage racks).
- Infill vacant lots with structures and uses to create continuity of pedestrian experience.
- Balance on-street parking with other uses.

. . . to Management

- Change traffic signalization or street utilization to improve pedestrian access.
- Improve utilization of parking through changes in enforcement or regulation.

. . . for Transit

- Establish neighborhood shuttle or circulator vehicles.
- Adjust or expand route locations and schedules.
- Create intermodal centers, allowing transfers between transportation modes.
- Establish services for special users (children, teenagers, elderly).

Sociability

Because neighborhoods are social places, the attribute of "sociability" is a crucial component of any good community place. When people meet friends, see and greet their neighbors, or even feel comfortable interacting with strangers, they tend to feel a stronger sense of place or sense of attachment to the community.

This is generally a difficult quality to achieve around transit facilities, because the type of activity (waiting for a bus or train) is not often a social experience; the vehicles themselves can create barriers to the sociable use of a space through noise and fumes. However, successful transit stops that integrate other uses and activities help to reate an environment where socializing can naturally take place.

Visible Signs . . .

. . . of Success

- People use the place (or facility) regularly by choice.
- Users know each other by face or by name.
- "Triangulation" occurs (an event occurs causing strangers to talk to each other).
- People bring their friends and relatives to see the place or they point to one of the elements with pride.
- People are taking pictures; many photo opportunities are available.
- Strangers make eye contact; people smile and display affection.
- There is a mix of ages and ethnic groups that generally reflects the community at large.
- Chance encounters happen frequently, as people tend to run into someone they know.
- People tend to pick up litter when they see it.

. . . of Problems

- People do not interact with other users of the place.
- There is a lack of diversity of people using a place.

Ways of Measuring

- Record people's use and behavior at different times of the day, week, and year.
- Record the location of activities.
- Survey people about perceptions of a place.
- Identify the number of people who volunteer to help or just assume responsibility for a particular area.

Approaches . . .

. . . to Design

- Develop public gathering places to accommodate a variety of community activities.
- Arrange amenities to encourage social interaction (e.g., groupings of seating, movable seating).
- Provide a variety of uses in adjacent buildings to attract a diversity of people.

. . . to Management

- Stage special events and activities to draw people.
- Encourage community volunteers to assist with improvements or maintenance of a place.

. . . for Transit

- Integrate transit stations into spaces where socializing and community activities take place.
- Design facilities so that there is room for social activities to occur.

Note: Two publications by PPS are especially useful in understanding and applying different observation and survey techniques. They are *What Do People Do Downtown* and *User Analysis for Park Planning and Design*. Both are available for purchase from PPS at 153 Waverly Place, New York, New York 10014.